VOLUME LVI JANUARY, 1900 No. 3

AMERICAN JOURNAL OF INSANITY

CORTICAL FUNCTIONS AND PSYCHOLOGY.

BY HERBERT NICHOLS.

The functions of two-thirds of the cortex are unknown. I wish to suggest a few possibilities regarding them—not for the purpose of putting forward any new hypothesis; but, pleadingly, for greater respect to the psychologic side of the problem, and in view of the chance that these activities, with brain activities in general, may *never* be rightly understood unless a broader psychologic interpretation be applied to them.

No notion is more common, in this field, than that the regions of the cortex having no immediate downward connections cannot be directly motor. Most of the current interpretations of the cortex are based upon this idea. Doubtless certain facts may be construed to such an opinion. The experimenter finds that his electric needle, when applied to the Rolandic region, produces tolerably definite movements; when applied to the 'association centres' of Prof. Flechsig it does not produce such movements, The psychiatrist observes that injury to the 'sensory centres' is accompanied by motor disturbances; while harm to the 'association centres' does not entail similar loss of motor control. But are these facts open to no other interpretation? Let us examine this, and see where it leads, with reference to the issue first stated.

What the nature of neural action is, no one knows. It may be a 'progressive secretion'; it may be a 'molecular wave'; there are advocates of both theories. But if unknown, why should one credit narrower capabilities to it than are established for elec-

tricity? Surely no electrician imagines that a galvanic cell, coupled in the middle of a series, is less directly 'motor' than one coupled at the end of the series. And here is an electrical example bearing still more strikingly on the problem: In the familiar 'call apparatus,' found in every hotel, are a lot of push-buttons (in the several rooms), and a lot of numbered 'announcers' (in the office) all strung on a single wire. Press any button, and a current runs through all the buttons and all the announcers, performing, however, only its one, specific act—the letting down of a particular numeral. By what simple principle of adjusted resistance this is accomplished is well known. But if difference of electric resistance may make 'internal' buttons thus control specific motor acts, why may not processes of neural summation or conditions of 'associated neural stress' among inner brain cells, enable them to control similar acts; and to innervate now one cortical outlet, and again another; and all with as much functional directness as when the electric needle is applied to a given fibre?

To discover why a suggestion so near at hand has not received greater attention from physiologists, one does not have to hunt far. Unmistakably it is because of certain arguments that have been rightly or wrongly urged, from the psychologic side of the problem. But before I recount what these, in general, have been, and their bearing upon my main subject, let us pursue the possibility of 'internal motor impulses' into the domain of psychology a little independently of these 'have-been' arguments and traditions; or in such a manner as we might expect a physiologist to view the problem, who was really freed from "antiquated metaphysical speculations." Doubtless there is no principle of psychology more firmly established than that every association is the resultant of all the multifarious habit-tendencies brought into play at the passing moment. Freely translated into neural terms, this means that every associational excitation is determined by the total activity of the brain at the passing instant. And approaching the brain without preconceived notions and in the light of its apparent physiological similarity throughout, one could scarcely refrain from inferring that we have, here, a fundamental law of all neural activities; and as well of those which pick out and innervate some motor channel, running downward from

the cortex, as of those which pick out and incite any ideational activity running entirely within the cortex.

That such a principle strikingly accords with the suggestion that was so forcibly thrust upon us from the analogies of electricity is evident. For, plainly, under such a law of summative association and excitation, any internal cell would be of as direct functional influence as any other. Moreover, it should be well noted, the evidence above recited as construable for the current notion of specific motor centres would be perfectly reconcilable with such a law: To apply the needle to some outlet-channel of the cortex, and to get therefrom a movement of the muscles to which that channel runs, is precisely what one should expect, under such a law. To be able to pick out the myriad constellation of internal cells—the neural correspondents of a given thought—that sometimes, as directly, innervate the same muscles, by the same channel, and to be able to apply a multitude of needles to those in a way to produce the thought and movement, is what no sane man should expect. So, also, a circumscribed lesion in the region of Broca should be expected by the psychiatrist, under this law, to be accompanied by loss of speech; while a lesion of equal dimensions in Flechsig's hindersphere would not be conceived to work a similar effect, notwithstanding that this region, as a whole, would govern the organs of speech upon precisely the same principle as do the cells of the region of Broca. The same principle would be at work everywhere; every cell throughout the entire brain would exert, when active, a direct line of influence upon the motor-outlet to which the whole brain activity was associatively focused. Yet the geometry of the lesion would still be a variable factor; if located close to the focus of outlet, it would cut out many of the lines of influence funneling through it to that outlet; if situated further away, it would affect fewer such lines. Moreover, the anatomy of the cortex would still be a factor, inasmuch as the association fibres run in differently grouped bundles, rather than in evenly distributed geometric lines; in one place the lesion would harm many, and in another place few, such fibres.

It would seem, then, and unless carefully weighed evidence be found to the contrary, that if physiologists are to be advised at all by psychologic teachings, in deciding this important matter

of cortical centres, they should be brought by this best established of all its doctrines—by its basal law of association—to quite other conclusions than those now held by them; that they should be led, thereby, to conceive every cortical cell to be directly motor, for every muscle; and that no lines at all can be drawn dividing the cortex, here into motor spheres, and there into non-motor spheres. At least, this view of the matter should now bring us to examine the psychologic arguments and influences that have led to the commonly held notions regarding these 'spheres,' with heightened interest.

To get quickly to crucial points, and as probably may be done without exciting dissent in any one, let us assume, immediately, that certain cortical cells act with different 'specific energies.' Let us assume, also, that certain more or less vaguely definable regions of the cortex, lying for the most part around the terminations of the different sensory nerves, respectively, have each its characteristic 'energy'; that there is a sight sphere in the occipital lobes; a hearing sphere, a taste sphere, and a smell sphere in the temporal lobes; a touch, muscle and 'general feeling' sphere in the Rolandic region, and so on; and let us join with Prof. Flechsig in calling them, in general, 'sensory spheres.' There are then left the interlying areas between the sensory spheres—the great "two-thirds of the cortex" that I mentioned in the first line of this paper as still 'unknown' and in dispute.

Regarding the sensory spheres—thanks to the general advance of our day in both physiology and psychology, but especially to the influence of such broad and penetrating specialists as Prof. Flechsig—we are now permitted to look upon them far differently than a very few years ago. There was a time, as every reader of this JOURNAL will remember, when none of these centres was conceived to be both sensory and motor; and but a very limited area was thought to be motor at all. And had I not written elsewhere in these pages[1] of the psychologic traditions that misled investigators to such restricted notions, there would be call for a fuller review of such influences here than consequently is now needed. As it is, I have but to remind the thoughtful physiologist, that it was a certain speculative notion as to the

[1] The Psycho-Motor Problem, vol. liv, p. 59, 1897; and Psychology and Physiology, liv, p. 181, 1897.

specific nature of the human will—a purely psychologic notion, and a purely metaphysical and ancient one at that—which led the first experimenters too easily to adopt the notion of a narrow and exclusive motor area; that it was only by slow and difficult conquering of such traditions *in the minds of physiologists* (and unconsciously absorbed by them from their day and generation), that permitted this theory to widen out, first to a Muscle-sense Theory of Will, that at least allowed the Rolandic region to be both sensory and motor; then to an Innervation-sense Theory, that was supposed to open the frontal lobes to the expanding notion; then to a Kinæsthetic Theory, that liberated parts of the present sensory spheres; and eventually to the highly enlightened recognition, by Prof. Flechsig and others, of what, had it not been for these unconscious prejudices of men who, while they cry loudest against 'psychologic speculations,' remain above others blindly and antiquatedly steeped in them, would otherwise have been, at the first and from the general look of the brain, the most obvious, possible suggestion; namely, to recognition of the fact that all of the sensory spheres—each one in its specific way—are alike, and, throughout, both sensory and motor. And having jogged our minds as to this history of our subject, and as to the influences that have made it so difficult, we may note of the outcome, that these sensory spheres have now been brought to be viewed in practical harmony with the conception which we have found suggested by several unprejudiced approaches to the problem; and that we may, therefore, now turn to the remaining 'disputed areas' with interest heightened by the suspicion that the confusion of opinion, which still surrounds them, is due but to a prolongation of that unconcious subservience of physiologists to traditional metaphysical influence which has so hindered the problem of cortical functions, always.

I am aware that Prof. Flechsig's 'association centres' are not accepted with entire satisfaction, generally. Yet no one can read his 'Gehirn und Seele' (Leipzig, 1896) and be at all acquainted with the subject, without recognizing it to be the most comprehensive presentation of the intricate problem that any one has yet had either the courage or the learning to put forth. With entire safety we may use it as our reference-text for bringing out the crucial points involved.

Careful reading discloses that two psychologic facts have determinative weight in Prof. Flechsig's opinions: (1) Our perceptual processes are 'sharp and clear,' while our thought processes are not. (2) Our memories have not the same 'specific energies' as their originals. Starting from these, Prof. Flechsig deduces that *the 'essential components' of this 'sharpness and clearness' of our perceptions are their said 'specific energies' or sensation elements;* and that the 'higher thought processes,' not displaying this 'sharpness and clearness,' have no specific energies, and are "for the most part unconscious activities." Such fundamentally unlike psychologic processes must, of course, be based upon correspondingly unlike neural activities. And pointing out the abundant and unquestioned evidence now extant for proving that the terminal areas of the cortex are concerned in original perception, he endows these with the designation 'sensory spheres,' and summoning what must be confessed to be an erudite and ingenious array of arguments for believing that the remaining areas are concerned rather with memory and the building or associating together of the higher complexes than with original experiences, he sets these areas off by themselves as unconscious regions, endows them with all the functions of abstract thought, reason, intellect, voluntary control and the higher sentiments, and designates them 'association spheres.'

The 'sharpness and clearness' of perceptions is due to the presence of sensory components; the 'unconsciousness' of thought processes is due to the absence of sensory components—upon these psychologic assumptions hangs Prof. Flechsig's entire line of argument! Let us, then, give them close analysis.

In perception the cortical excitations come from without the body: An object stands before us fixedly; a definite combination of stimuli reach in through the multitudinous fibres of some sensory organ to strike and to hold the corresponding sensory keys of the brain with firm fingers and so long as the conditions of outer stimulation do not change. Here the perceptual picture is held firmly and continuously before the mind for a considerable time. On the contrary, in the swift processes of thought and of reason there is no external grip holding the keys; all now depends upon the shifting balances, and instantaneous resultants of a myriad of passing kaleidoscopic associational combinations.

Here surely, is one reason why perceptual pictures might look 'sharp and clear,' while thought pictures should be vague and fleeting, though both were built of the same sensory components.

But again! Few things are better known in psychology, than that certain elements may be *present* in perception without being *noted*. Continually one's field of vision includes objects to which we are as *inattentive* as to the sensory content of abstract thoughts —provided that such thoughts have sensory content. But if sensory elements must be *attended to and thought of*, in order that their presence in the mind be appreciated, surely here is other ground for suspecting that thought processes may be based upon the same cortical elements and specific energies as are perceptual processes. Attention to and recognition of 'clearness and sharpness,' even if they exist, demand associational processes awakened by and joined to their underlying brain elements, whatever these may be. And in the fact that the outer stimuli of our original perceptions reach in, forcibly and lastingly creating such associations, while thought processes are too fleeting to exert such creative influence, is sufficient explanation of why recognition processes are subjoined to our perceptual images, while they are not subjoined to our thought images. As the evolutionist will say, it is of hourly advantage to examine the make-up of our perceptual impressions (not as perceptions, but as objects), while it would be a positive hindrance to develop a like habit of examination of our thought images.

But there are still other and more fundamental influences at work in Prof. Flechsig's problem; and such as I have had specially 'in eye,' from the first, as illustrative of the need of the best psychologic training, among physiologists, in order to solve the secrets of the cortex. In Prof. Külpe's new 'Outlines of Psychology' (1895), (undoubtedly the most severely scientific textbook in its field), 54 out of 454 pages are devoted to 'Fusion.' And the subject is occupying proportional attention elsewhere, in the forefront of current psychology. What then is 'Fusion'? Few tasks would put the psychologist to greater embarrassment than that of explaining its full historic and philosophic bearings to those physiologists who conceive psychology to be, if it be sound or safe, but a branch of their own science. Nevertheless, it has now pushed itself into the region of exact laboratory ex-

periment in a way that has immediate and practical bearing on the problem of Cortical Spheres and Functions. The following facts will serve to bring the general matter sufficiently before us.

If certain notes, for example, any note and its octave, be played on most any musical instrument, under certain conditions they will be heard as *one* completely fused tone; under other conditions they will be 'clearly and sharply' distinguished as separate tones. If the five fingers of one hand be pressed on the skin of the other hand, under certain conditions of attention they will be perceived as one touch; under other conditions the five separate finger-points will be distinctly noted. If the teeth of a coarse comb be pressed on the bare shoulder, most persons will be unable, under any conditions, to perceive aught but a single, fused impression; but after a few days' 'education,' nearly any one can be brought to discriminate separate points within the area of a pin-head. Similar experiments may be stated in terms of every one of our senses—taste, smell, sight, muscle-sense and even pain. How then shall we explain this general fact, that precisely the same mode of stimulation of the same identical nerve fibres produces, upon one occasion, a psychically fused whole; and, on another occasion, a multiplicity of 'sharply and clearly' perceived 'sensory elements' and parts? Within this question we at least catch sight of the problem of 'Fusion.'

As to the theory of these facts there are antagonistic schools of opinion. One school believes that it is native to sensory elements, upon stimulation of their underlying brain elements, to rise in the mind separately, and that they gain the habit of fusion under certain conditions. The other school holds the opposite: that it is native for all elements to fuse into one indefinite whole; and that the 'sharp and clear' separateness, declared by Prof. Flechsig to characterize perception, is what is engendered by educational development and habit. And there is still a third school which looks upon neither mode of result as primary to the other, but is content simply to note the facts regarding which all schools must agree. Namely, that any set of brain elements which, through life, are joined together by successive grouping more habitually than by simultaneous grouping, will, upon simultaneous stimulation, throw their sensory elements into the mind separated, or each one standing out sharply and clearly

by itself; and that, if joined together simultaneously more habitually than successively, they will throw their sensory elements into the mind 'fused,' or blended to one whole. In any case, so all these new investigations seem to show, whether the psychic results of brain activity form 'sharp and clear' perceptions, like the highly wrought landscapes of vision; or 'indefinite vomits of sensory eruption,' as in emotion; or variably distinct components, as in the harmonies of music; or 'swift manœuvres of the o'ershadowy night,' such as our thought pictures may prove to be; always the presentative or pictorial effect depends, not so much upon the sensory counterparts or specific energies of the brain elements involved, as upon the associative life-habits of these elements, collectively and as a specific group within themselves.

Formally summarizing these facts we may say: Given the brain elements a, b, c, d, if these be stimulated, habitually, more often in succession than simultaneously, then when they *are* stimulated simultaneously their corresponding sensory elements will stand out in the resultant mental picture or presentation, separately and distinctly. But if they, habitually, be more often stimulated simultaneously than successively, then when they are stimulated simultaneously their sensory elements will appear in the resultant mental presentation as a fused whole. The full proofs for such a law I have no space here to press upon the reader. I will ask him to weigh, alone, the following significant truths: To observe that it is through the retina, whose nerve ends are so exposed that they *can* be stimulated in every direction serially, and to a mode of stimulation that above all others sweeps over them most easily and often in series, that we gain the most highly wrought mental pictures. That from the ear, whose nerve ends are so fixed in the cochlea that they can be stimulated, for the most part, only in one single order of succession, we get only scales, melodies, and fused harmonies; and never such pictures of two-dimensional succession as we get from the eyes. That from the nerves of smell and of taste, whose anatomical arrangement as well as their mode of stimulation confines them to mass or simultaneous stimulation only, we never get but mass or fused sensations. That from the skin, whose nerves of touch are so arranged that they may be stimulated in two-dimensional series,

and whose stimuli move over its nerve ends successively in every direction, we again do get spatial or two-dimensional presentations. That from the temperature nerves, though their arrangement is precisely the same as that of the touch nerves, yet because their source of stimulation is such as affects them collectively rather than successively in single series, we do not get spatial pictures, but only closely fused feelings of temperature. That from the muscles, sinews, and viscera, whose nerves also are stimulated in masses, we also get only 'mass feelings.' And, finally, that from the thought processes of the cortex, whose groupings we have reason to conceive must be too generally kaleidoscopic and promiscuous to permit the habitual development of those serial threads of excitation that we observe to be the source of the highly wrought pictures gained from touch and from vision, we receive only such vague and indistinct presentations as Prof. Flechsig has been led into dubbing "for the most part unconscious."

From the first I have declared it was not my purpose to urge any new hypothesis regarding the cortex spheres and functions, but alone to plead for profounder study, by physicists and physiologists, of their psychologic implications. But if this be not effectively accomplished by the above suggestions, then must physicists and physiologists be obdurate indeed. Let one be as averse to metaphysical dreaming as he may, yet he must be bigotedly blinded to experimental and empirical evidence of the severest scientific sort not to appreciate that psychology, here and at last, is on the track of a great fundamental law which is to instruct us *when* it is, if it does not explain *how* it is, that brain activities produce 'sharp and clear,' or highly wrought, mental pictures, and when indefinite, shadowy and indistinguishable weavings—and this, too, under the hypothesis that *all the spheres of the cortex alike are sensory and have 'specific energies,'* and are 'conscious.' He must be a dull and impractical neurologist who does not see that here are matters that *must* be considered before cortical functions and areas can ever be hoped to be untangled. And he must be an incompetent psychiatrist who does not kindle to the truths that here are matters to be taken into account before the pathology of these functions and spheres can be comprehended. On the other hand, who that broadens himself to such

considerations, but feels the entire problem of mind and brain reaching out to a wider, firmer and more unified basis of interpretation in every sphere of science! Who that comprehends that the weaving of space pictures is now being carried back, experimentally, to characteristic brain habits, which brain habits are solely representative of the time grouping of outer stimuli; or, in other words, who that comprehends that space pictures *can* be only representative of the *time grouping* of outer events, but must understand that psychology, physiology and physics are now uniting to bring the vexed problem of 'outer space' to something nearer than mere metaphysical poetizing! Who that sees the weaving of mental pictures, the laws of mental association, and of motor innervation in general, all carried back to the same universal laws of neural action, but must feel that psychology, physiology and comparative biology are close upon uniting to bring the great problem of the relation between body and mind, to far more satisfactory formulation than is suggested by dividing the cortex into hermaphrodite spheres of conscious action and unconscious action, specific energies and non-specific energies, motor functions, and non-motor functions!

More earnest respect for and interest in the psychologic side of cortical and neurological problems; better training in psychology generally for 'scientific men': it is for these I am pleading. Is it not shameful that of one of our latest and best physiological text-books our leading scientific journal could say, in reviewing it, "it would be better if the author, before writing it, had read some primer of modern psychology"? Of our psychologist it is now demanded that he be a tolerably expert neurologist, physiologist, pathologist and physicist. Yet a physiologist without even a primer acquaintance of his brother's subject may decide that psychology is 'a branch of physiology,' and all psychology that is not psycho-physics is necessarily speculative and false. But putting all this aside as unworthy, if better psychologic training is necessary to the medical profession in all its branches, from whence is it to be expected, and where obtained? In the academic schools of psychology as at present administrated by the philosophical departments of our different universities? With sadness I must answer No! in them is little hope. Twenty years ago a 'new era' of psychology was heralded; it

was to become 'scientific.' All our larger universities and colleges responded to the cry with genuine and most earnest enthusiasm. But the result has been in the highest degree disappointing. The enthusiasm has well nigh been spent; little, very little, has been accomplished; and academic psychology seems now to be going backward rather than forward, with reference to the standard of science. It was too much to expect that psychology, so long as it remained controlled entirely by men whose previous training had been confined to certain traditions, and who, though inspired by the most exalted intentions, could never so suddenly and wholly jump out of their skins as to become immediately scientific, should speedily fulfil its new ambitions. For our academic courses in psychology to have been put upon safe ground, they should, from the first, have been taken from exclusive philosophic control, and placed under a mixed administration, wherein should have been represented the departments of biology, physiology, neurology, psychiatry and physics, as well as of philosophy. As it is, there is little to expect from the present philosophical administration of 'scientific psychology.'

But may not medical schools take up psychology for themselves? From these also there is little to expect in general. If there are still fetters to the philosophic administration of psychology, this must frankly be admitted to be because of no remnant of intent, on the part of modern philosophers, to hold it back from any possible developments. If scientific psychology is still delayed it is now far more the fault of medical men than of 'speculative metaphysicians.' No doubt there are explanatory reasons for this. Medical men are now absorbed with great problems specially their own. They have inherited a righteous distrust of the past methods of metaphysical psychology, and have not yet had their confidence fully won to the belief that psychology can be otherwise than falsely metaphysical.

No! there is little hope of a rapid advance to any truly scientific psychology, either in philosophical departments or in medical schools in general. But from psychiatry and from psychiatrists there is *much* to hope. The brightest prospect to-day for psychology, so I believe, is in this field. It is because of this belief that I have dared to pen this hasty and ill-ordered paper to the readers of this JOURNAL.

COMMON FEATURES IN NEURASTHENIA AND INSANITY: THEIR COMMON BASIS AND COMMON TREATMENT.[1]

By G. W. FOSTER, A. M., M. D.,

Asst. Physician, Government Hospital for the Insane.

The point of view it is proposed to adopt with relation to the cortical changes that find expression in Neurasthenia and incipient Insanity is the converse of that adopted in establishing, by continued differentiation, a more precise conception of the varieties which these disorders may present in different individuals, and under different conditions. The point of view is chosen rather for observing what is common and essential to all of them, in their symptoms, causes and morbid changes, and by a process of induction to determine the principles that should govern their rational treatment. For, if different forms of a disease present only different phases of an essentially single morbid process, it is evident that a collective and comparative study of them will afford a clearer insight regarding the essential process, and each of its manifestations, than would the separate study of each. For this purpose we may not only give to neurasthenia its widest conception, but we may include other forms of nervous weakness, as hysteria and hypochondriasis, which affect the cortical cells and give rise to common symptoms.

That these disorders clinically merge into each other by insensible gradations, and that they have similar exciting causes, does not admit of question. For authority and illustration we have only to refer to standard text-books.

Gowers,[2] in treating of hysteria, says:

"In rare cases there may be such an amount of mental disturbance as to raise the question whether the patient is actually sane, and sometimes

[1] Read before the Medical Society of the District of Columbia, Nov. 29, 1899.

[2] Diseases of the Nervous System, p. 1010.

the limits of sanity are distinctly passed. The relation of insanity to hysteria is a subject, however, on which generalization is difficult, and different opinions are held by competent authorities. Sometimes, however, pronounced mental aberration seems distinctly to grow out of the slighter psychical disturbance of hysteria, and the process may be apparently similar to that which leads to the more grave corporeal symptoms.

"Just as a mind unfixed by emotion may become set, in its unbalanced state, by a fixed idea of motor inability, and the latter may progress to extensive paralysis or contracture, so the intellect may become the prey of such an idea as must be regarded as an insane delusion, under the influence of which the mental powers may fail further. An emotional girl, for instance, with frequent globus, became possessed of the idea that all persons whom she met were making faces at her, and she manifested timidity, infantile in its degree, so that she dared not go out of the house alone, and became irritable and depressed, with a vacant look, and such loss of memory as to constitute partial dementia. Such cases may be most various in their form, and the ultimate symptoms may resemble those of simple insanity, from which they are to be separated, if at all, only by the conditions of their origin. There is another important relation of hysteria to insanity. The later stage of a developed hysterical fit is a paroxysm of mental disturbance of maniacal violence, in which chaotic storms of emotional frenzy alternate with hallucinations and delirium. The patient is, for a few minutes, wildly insane. Just as some of the muscular spasms of the hysterical convulsions may continue, or may occur alone, as persistent contracture, so some elements in the paroxysmal mental disturbance, hallucination or delirium, may occur alone.

"In a hysterical child, whose case I have described at length elsewhere, apart from the delusions that accompanied the convulsive seizures, there were occasional periods of spiteful mischievousnesss, wholly foreign to her habitual character, and also periods of a semi-demented state, lasting for days or weeks. The subject of such mental disturbance may threaten or attempt suicide, apparently with every intention of success.

"In another patient, a girl of twenty-six, violent delirium accompanied each hysterical convulsion, and after a time paroxysms of mental disturbance occurred without any preceding fit. After an interval of improvement a condition came on which rendered her confinement in an asylum necessary. She recovered but relapsed, on account of mental shock, and passed into a very unpromising state, with most degraded habits, but ultimately became well."

Of *Hypochondriasis* the same author says, p. 1040:

"Hypochondriasis is a morbid state of the nervous system in which there is mental depresssion, due to erroneous ideas of such bodily ailments as might conceivably be present. This limitation is necesssary to distinguish the condition from those forms of actual insanity in which there is a delusion of the existence of some impossible ailment, impossible

either in its nature or else by reason of its incompatibility with life"—a distinction which appears very slight in view of the patient's presumed ignorance of many physiological conditions which might determine such impossibility.

Again he says: "The affection consists in a particular disposition of the brain which leads to habitual anxiety without adequate cause, and to the concentration of this anxiety on the patient's own health. This morbid tendency is often a matter of individual temperament, which may be the result of neurotic inheritance; the most severe forms occur in persons whose family presents a tendency to insanity. In other cases there is no morbid heredity, but the state is acquired through persistent ill health, which sets up the morbid mental habit of self-attention and concern. These two causal varieties may be called the 'acquired' and 'temperamental' forms." Again: "Many cases are on the border-line between soundnesss and unsoundness of mind"—and again: "Such patients are often actually insane."

On the subject of *Neurasthenia* I still quote from Gowers, p. 1045:

"It has become fashionable to apply the term 'Neurasthenia' to conditions of weakness of the nervous system. The use of the word has brought with it a tendency to regard the condition just denoted as a definite disease. Books have been written about it, and it has been divided into numerous classes according to the character of the symptoms that are present, and the causes that give rise to it. It is convenient to be able to designate the condition by one word instead of two, but there is no more justification for regarding Neurasthenia as a definite malady, as a disease due to a definite morbid process, or even as an affection characterized by a well-marked group of symptoms, then there is for adopting a similar course with regard to 'debility' among general diseases. Neurasthenia underlies and may cause a large proportion of the functional diseases of the nervous system, and when neurasthenic patients seek advice, there are, in many cases, symptoms of nerve-disturbance sufficiently definite in character to bring the case into some special category. Moreover, the conception has furnished the material for the exercise of an unlimited amount of intellectual ingenuity, in a *quasi*-scientific process of elaborate description and multiple classification. Like other general terms, it has a tendency to hinder investigation, and to prevent the thorough study and the due discrimination of the nature of maladies, essential alike for the progress of medicine and the treatment of disease." Our author accepts the name, however, but restricts its use to those "cases in which there are symptoms of disturbance, or of impaired function of the nervous system, more or less persistent, almost infinitely various in their features, but which have in common the negative characteristic that they do not conform to any of the types that have received definite names."

Bearing in mind this infinite variety of form, which implies transitional forms differing by almost imperceptible degrees, let us pass to the cerebral type, or that in which cerebral symptoms more or less predominate, in order to institute a comparison with the early manifestations of insanity. On page 1048 the author already quoted says:

"But as the most special, elaborate and complex part of any system is that most prone to suffer, and exhibits in greatest degree the effects of general impairment, the functions of the brain seldom escape disorder in these cases, and often the cerebral disturbance is the most pronounced manifestation of the state. All the functions are apt to suffer: mental power is lessened, the ability to concentrate the attention fails, memory is imperfect, and the influence of the will upon it, in 'recollection,' is weakened in special degree. There is as much conscious difficulty in mental as in physical exertion, and, in proportion as the sufferer shrinks from the unpleasant effort, the resistance that has to be overcome seems to be increased. All which seems to be expressed by varied sensations, psychical or cephalic. The subjective discomfort in the limbs and back, depresses the brain, on which, often, the effects of the varied sensory symptoms seem to be focused. A large proportion of these, indeed, arise in the sensory centers of the brain, and the interaction of all its parts is such that the disturbance of one region influences the whole. Purely mental functions suffer with the rest; mental depression is conjoined with irritability, and every annoyance is magnified into a disaster."—"Visceral symptoms, pain, discomfort of many kinds, and even definite disorders of subordinate functions are frequent, but those of the digestive system are of special importance. They are to be recognized as distinctly augmenting other symptoms in about two-thirds of the sufferers, and a close relation between gastric disorder and cephalic discomfort is especially conspicuous."—"Sleep is seldom good, restlessness and insomnia increase the nervous prostration, and often, when the patient does sleep, he wakes unrefreshed, weary, and languid."—"The further development of such effects of malnutrition usually takes the form of one of the definite functional ailments already described, many of which, as neuralgia, hypochondriasis, hysteria, really consist in a high degree and elaborate development of the effects of the condition now under consideration. The description of the symptoms might be multiplied indefinitely, and yet so various are they that no description however lengthy, would embrace half the varied manifestations of mere nervous weakness."

The limits of this paper will not permit of an extended comparison of the symptoms which mark the early forms of insanity with those of the disorders just passed in review. Fortunately an extended comparison is not necessary. Their practical iden-

tity has been established upon the highest authority, and may be confirmed by any competent observer. Writers of such eminence as Griesinger and Bevan Lewis have insisted upon an early stage, which they designate as the *stadium melancholicum*, common to a great majority of cases of insanity, whatever may be the form assumed in later development of the disorder from the degenerative or disintegrative processes thus inaugurated.

That this early stage is not oftener recognized is due to the fact that these early symptoms are not, in the minds of the patient's friends, associated with insanity, and the subject of them does not come under competent medical observation until the disorder has reached a more advanced stage. But if the friends are intelligent and observing, the physician can, by careful inquiry, usually elicit evidence of the preceding stage. The important point of the essential unity in kind of these disorders cannot, however, be passed over without an effort to impress it distinctly upon the attention, with an especial reference to the next division of our subject—the nerve-cell, its structure, and the changes it undergoes as the result of normal function, of fatigue and various pathological influences.

I cannot do better than quote from Bevan Lewis' valuable work upon mental diseases, upon the development of melancholia and mania. In the second edition, p. 143, he says:

"Simple pathological depression is ushered in by that *failure in object consciousness* which invariably inaugurates a corresponding *rise in subject consciousness;* and which we have reason to infer, implies a diminished functional activity in those realms of the cerebrum correlated thereto. The patient exhibits a growing indifference to his former pursuits and pleasures; the ordinary duties of life become irksome and devoid of interest; especially do all forms of mental exertion cause ennui and distaste; the attention cannot, as formerly, be directed without undue effort, and so reading becomes laborious and thought sluggish and monotonous. The environment fails to call up pleasurable sensations—a dreariness and gloom pervade the outside world, since it is interpreted in terms of the predominant feeling."

Also on p. 157:

"The very earliest signs preceding general pathological depression are really the symptoms of cerebral anaemia and nervous exhaustion. The cerebral functions are torpid, there is diminished activity both of the impressive and expressive realms of the cortex, as above described, and

negative states predominate throughout. The subject is heavy, languid, sleepy; frequent yawning occurs—not the *insomnia* of a more advanced stage; intellectual efforts are oppressive and thought becomes dreary, monotonous and painful. If the warnings thus afforded be disregarded, there arises a *frequent recurrence* of a *painful idea, occasional sensory hallucination, sleeplessness*, all indicative of a commencing pathological change—of impaired centric nutrition."—"Viewed from the mental aspect, the highest psychical operations are at first enfeebled; abstract thought becomes oppressive or impossible; attention impaired or restricted; sensations are less vivid, and perception is incomplete or wanting in detail or imaginative vigor—the representative faculties especially being infeebled."—"In these states the reaction on the outer world may be characterized by fitful irritability, impatient conduct, sluggish, mechanical actions, or by entire suppression of volitional initiative. Both sensorial and motorial functions are sluggish, or in abeyance, and the functions of organic life are all depressed. The vitality of the organism as a whole, being largely dependent upon the activity of the nervous centers, must necessarily suffer when this important regulative system is deranged; the condition is truly one of *devitalization*—the life is carried on at a lower level."

Upon p. 196, upon the subject of mania, this author says:

"The incubative period of mania is but a record, in most cases, of a very gradual declension in mental vigor, not perhaps apparent to the friends, but sufficiently evident to the subject himself. Intellectual operations become more laborious than usual, thought is sluggish, and tends to wander (attention being fugacious); strange and unusual lapses of memory occur—the patient is 'absent' and forgetful. All mental operations are not only difficult and tedious, but are followed by weariness and *ennui*, and a gloom overspreads the mind, for which there is no obvious cause. At night the subject is restless, obtains but little sleep and awakes unrefreshed, with gloomy forebodings and a disinclination for all forms of exertion; in fact a frittering away of nervous energy has brought him into the first stage of his malady—that of simple melancholic depression, to which all the foregoing remarks we have made with reference to simple melancholia apply. This, the first stage of his reductions, is the *stadium melancholicum* which precedes all forms of mental disease."—"This premonitory stage is of most variable duration, ranging from days to weeks, or from weeks to months; it may passs off under favorable circumstances, and again recur as former conditions of life are resumed."

It can scarcely have escaped the attention of any, that the language of Gowers in describing cerebral neurasthenia is almost identical with the above, as the state described is absolutely the same.

Both authors deal with their subjects largely on the psychological side. Let us see how closely they can be approached upon a pathological basis.

The progress of the first half of the present decade is marked by the establishment (accepted by the majority of investigators) of the structural independence of the nerve-cell and its branches; and by new facts relating to its external form, the pathways followed by its branching processes, and the anatomical and physiological relations of the cells to each other.

In the latter half of the decade investigation has been chiefly directed to the internal structure of the cell, and its alteration under morbid conditions.

Many of the data resulting from such investigations, which will be briefly referred to, may be found more fully and systematically stated in an interesting critical digest by W. Ford Robertson upon the "Normal and Pathological Histology of the Nerve-Cells," published in the summer number of "Brain," for 1899; and I wish to acknowledge my indebtedness to this author in the free use which is made of his work.

For our present purposes we are chiefly concerned with the two chief constituent parts of the cytoplasm—the Nissl-bodies, or chromophile elements, and the achromatic or achrophile parts; their relation to the integrity and function of the cell; certain established facts of experimental pathology; and certain typical morbid changes affecting the nerve-cell.

In 1893 Nissl described the bodies contained within the nerve-cell which bears his name. He demonstrated that the cytoplasm consists of two distinct parts, as shown by their behavior towards methylene blue. Granules or masses having varied forms and arrangement, but uniform and characteristic for each type of cell, are colored with a more or less intense blue. It is now generally conceded that the intensity of coloring is determined largely by the functional state of the cell, as well as by morbid degenerative changes to which they are subject. These Nissl-bodies, or chromophilic elements (parts, substance) are more abundant and characteristically distributed in the resting condition. In fatigue they become more or less diffused, disintegrated and granular, and take the stain less deeply. In extreme exhaustion and under certain morbid conditions attended with

abolition or weakening of the cell's function, the chromophile elements may practically disappear. They are therefore physiologically associated with the function of the cell, and are regarded as storing up energy which is utilized through characteristic discharges in accordance with functional requirements. This portion of the cytoplasm is exhausted by fatigue and restored by rest—especially by sleep.

The achromatic, or achromophile part of the cytoplasm is generally regarded as the fundamental part, whose disintegration entails the absolute destruction of the cell. This portion does not take the methylene-blue stain, but is obtained by special methods with hæmotoxylin, iron hæmotoxylin and other dyes. Its investigation has been difficult; due in part to the obscuring effects of the chromatic masses or granules. Advantage has been taken of cells which have been the seat of chromatolysis (the name applied to degeneration or loss of the chromatic portions) in which the structure of the remaining portions becomes more distinct; also of comparative studies in different animals, and of the effects of different staining methods.

It will be sufficient for the present purpose to briefly state the different structural features upon which there is a pretty general agreement; confining our attention mainly to the subject of chromatolysis, as the pathological lesion of neurasthenia, and the early period of insanity.

The later stages and graver forms of these maladies are also characterized by lesions of the fundamental portion of the cell, involving its destruction and permanent loss.

The achromatic part occupies the cell-body, protoplasmic processes and axon; the latter containing none of the chromophilic element. It consists of an organized fibrillar portion, and, probably also of a surrounding portion of unorganized protoplasm.

The parallel fibrils of the axis-cylinder are continued into the cell where they become continuous with a fibrillar reticulum, which prevades the cell-body, connecting its periphery with the nucleus wall, and continuing into the dendrons in a more parallel arrangement. It is agreed that these fibrillæ are the conducting portion of the cell. They also seem to maintain the structural form of the cell, and support the nucleus in its position, the latter becoming displaced only in lesions affecting the achromatic sub-

stance. This very brief and imperfect statement of the relations of these elements of the cytoplasm will have to suffice for our present purpose; and we may next proceed to consider certain intracellular changes accompanying the functional state.

The pioneer investigator of functional intracellular changes is Prof. Hodge of Clarke University, who described in 1889 the changes produced in the sympathetic ganglia of frogs and cats, by electrical stimulation of the nerves going to them. In 1892 he described the changes produced in the cells of honey-bees, and in the spinal ganglia and brains of the swallow, sparrow and pigeon, by fatigue. Reference was made last year by the writer, in a discussion, before the society, of Dr. Johnston's paper upon "Morbidity among School Children," to these results of Hodge and their confirmation and extension by Vas and G. Mann. The reason for again referring to them lies in their importance in establishing a connecting link between the physiological and the pathological cell changes, showing how the former pass directly into the latter when the fatigued cell is stimulated into further activity without intervening rest and recuperation, or when the nutritive process that normally restores the wasted chromophilic element is interfered with by deficient quantity or quality of nutrient plasma.

Hodge described the following changes in the sympathetic ganglia of frogs and cats, under prolonged electrical stimulation,[3] "in the nucleus, decrease in size, irregularity of outline, loss of open reticular appearance, darker staining; in the protoplasm, slight shrinkage, diminution of power to stain, or to reduce osmic acid, vacuolation; in the cell-capsule, decrease in the size of the nuclei. In the spinal ganglia and brain of birds affected by fatigue, there was shown diminution of size of nucleus, irregularity and jaggedness of its outline, darker staining of its reticulum, shrinkage of the cell-protoplasm, vacuolation (spinal ganglia) and enlargement of pericellular spaces." The experiments of Vas, Lambert and G. Mann show, under electrical stimulation, an increase at first in the size of cell-body and nucleus and, later, loss of chromatic substance around the nucleus. Mann "observed also an increased affinity of the nuclear

[3] Op. Cit., p. 249.

hyaloplasm for eosine, and slight diminution of the nuclear chromatine." "The nucleolus enlarged and became at the same time paler. After prolonged stimulation the nuclei began to darken slightly and to shrivel, and the chromatic substance of the protoplasm was greatly diminished." In the cortex of fatigued dogs he found "great diminution of the chromatic substance of the protoplasm, swelling of the nucleus, and pallor of the nuclear hyaloplasm; in the lumbar cord the chromatic substance of the protoplasm was diminished in amount and pale, the nucleus was darker than the protoplasm instead of lighter, and at the same time homogeneous and shriveled. In the retina of the dog fatigued by long exposure to light, as well as in the centers connected therewith, he also observed distinct structural changes. He summed up the conclusions derived from all these observations as follows: "During rest several chromatic substances are stored up in the nerve-cell, and these materials are used up by it during the performance of its function; activity is accompanied by an increase in the size of the cells, nuclei and nucleoli of the sympathetic, ordinary motor and sensory gangliar cells; fatigue of the nerve-cell is accompanied by shriveling of the nucleus, and probably also of the cell, and by the formation of a diffuse chromatic material in the nucleus."

Lugaro, while questioning some of the preceding results, agrees in the effect of fatigue in diminishing the size of the cell-body and its chromatic element and likewise a diminution in size of the nucleus and nucleolus. Nissl, whose conclusions at first were different, afterwards regarded the accumulation of the chromatic substance as "the anatomical expression of the resting state." Pergens, Pugnat, F. Pick and Luxenburg, all, by various methods, reached conclusions similar to those above stated.

Hodge, in his investigations already referred to, found that the period of rest required for repair of fatigue-reductions was in direct proportion to the extent of the latter, in some repair being scarcely complete at the end of twenty-four hours; while he believes that a point may be reached beyond which restoration of the cell is impossible. Precisely similar changes have been experimentally produced by injury of the cell-processes, and by the employment of various toxic agencies, including arsenic, lead, silver nitrate, phosphorus, malonnitril, alcohol, strychnine,

the toxines of tetanus, rabies, bubonic plague, diphtheria, and others. They also occur in inanition, experimental insomnia, experimental uraemia, anaemia, experimental elevation of temperature, ablation of the suprarenal bodies, etc. The communication of Robertson is largely taken up with the details of the numerous experiments of various investigators with these agencies, which space will not admit further notice of.

" Nissl, on the basis of his more recent extensive investigation upon this subject, maintains that 'each poison gives rise to special lesions and affects certain kinds of cells to the exclusion of others.' Lugaro states that in primary affections of the nerve-cells from toxic action the first to alter is the chromatic part; alteration of the achromatic part follows with a rapidity which varies with the various toxic agents, and with the type of cell. Different poisons give, in the same cell, alterations of different type, so also a given poison in the different categories of cells."[4]

Certain physiological regressive changes in advanced age have also been observed by Hodge, Luzinberger, Pugnat, and Robertson and Orr in the bee, the spinal ganglia of animals, and the cortical cells of man. These are of the nature of a chronic chromatolysis affecting scattered individual cells, while those around them may remain healthy. In this way senile atrophy is explained. Robertson thinks it probable that these regressive changes, typically seen in senility, occur to a slight extent through life, increasing as life advances; since such occasional disintegrating cells are found in the healthiest brains,—sickly individuals " which, from some cause, hereditary or acquired, have become unable to maintain a normal correspondence with their environment." The subject of chronic chromatolysis, on account of the difficulties in the way of experimental research, has not yet been systematically studied. The suggestion occurs that through this process the phenomena of the late nervous manifestations of syphilis may be partially explained.

The question of repair or regeneration of nerve-cells the subjects of chromatolysis, has a very important practical bearing upon prognosis and treatment. Considerable information upon the subject has been obtained experimentally, which is quite in

[4] Op. Cit., p. 259.

harmony with clinical experience as afforded by such acute affections as multiple neuritis, and anterior poliomyelitis.

Nissl found changes in the facial nerve-nucleus of the rabbit, after eruption of the nerve, to begin by breaking down and disappearance of the chromatin-bodies; changes beginning within twenty-four hours. All the cells of the nucleus were not equally affected, some remaining normal. The changes reached their height in from eighteen to thirty days, were stationary for a time, and then began to undergo repair. After fifty or sixty days the cells that had been affected could scarcely be distinguished. Ceni, in 1896, by section of the cord in dogs, obtained similar results in the cortex, resulting from division of the prolongations of the cortical cells; in hemisection of the cord the cells affected in the cortex were mostly upon the opposite side. Marinesco obtained similar results in the cord, by division of the peripheral nerves. He distinguished two phases of degeneration; the slighter, affecting the chromatic substance, he was the first to designate by the term chromatolysis (though this term has been extended to embrace, in its broader use, more advanced structural changes involving the achromatic part); he has also described degenerative changes occurring in the achromatic part, and was of opinion that some of the cells atrophied and disappeared. Lugaro removed a portion of a dog's skin, thus injuring the peripheral nerves, and examined the cells of the corresponding spinal ganglia after eighteen days. The greater number showed only more or less advanced chromatolysis, without alteration or displacement of the nucleus. After excision of the sciatic nerve at the level of the hip-joint, in twelve days more than half the cells were affected by chromatolysis in varying degrees. In the most advanced the cell-body was swollen, deformed, pale and filled with powdery remains of the chromatic part; the nucleus shrunken, deformed, displaced and deeply stained. After thirty-nine days similar changes were observed, but there was an evident diminution in the number of nerve-cells, and a prevalence of healthy cells. In some cells the degenerative process had gone on to complete destruction, in others repair had taken place. Lugaro gives a description of the reparative phase as observed in the hypoglossal nucleus of the rabbit after section of the nerve. It may be clearly observed in some cells

by the twenty-fourth day, when reunion of the cut ends of the nerve begins to take place. The cells undergoing repair are increased in volume, and stain deeply, owing to the density and large volume of the newly-formed chromatophile elements. After forty-six days a greater number of cells have become repaired. There are now no cells in the reactive phase, but there are still many pale, degenerate cells. After seventy-three days the density of the chromatic substance, and the volume of the cells undergoing repair, are still further increased. After ninety days the hypertrophy of the cells has obtained its maximum. After this they diminish in volume, and in an animal killed after one hundred and eleven days the hypoglossal nuclei of the two sides were indistinguishable from each other. Goldscheider and Flatau found that the milder degree of chromatolysis determined in the cells of the spinal cord of animals poisoned by malonnitril, was followed by restoration of the cells in three days, on the injection of hyposulphite of soda which arrests the symptoms of poisoning. The same investigators found that in experimental tetanus in the guinea-pig, the injection of tetanus antitoxine retarded the usual cell-changes, and caused a more rapid return to normal. With regard to the replacement of lost cells by the process of karyokynesis, there has been a considerable amount of research. Levi, who is one of the chief investigators, from observation of healing aseptic wounds of the brain and cord, although he has never observed complete division of a nerve-cell, is inclined to believe that it can occur. But he thinks it probable that it does not lead to a stable regeneration; and he has never found the process to occur in the very highly differentiated nerve-cells, such as the large cells of the cord and brain. He thinks that very highly differentiated nerve-cells, when affected by a stimulus undergo degeneration instead of attempting to multiply. Their reproductive capacity has become lost in favor of that of fulfilling their special function; the index of the loss of reproductive faculty being, probably, the paucity of nuclein, which diminishes with the higher differentiation of the cell. Chromatolysis, in different degrees of intensity, has been described by a considerable number of investigators in a score of different nervous diseases, both acute and chronic; and there seems to be no evidence that it has not been found, when sought for by the

approved methods, in all nervous diseases presenting degenerative symptoms, including the acute insanities and secondary dementia.

It is interesting, and affords valuable confirmation of the results obtained, to note the analogy which exists between the functional changes in neural cells and their relatives, the epithelial cells of secreting organs—as the salivary glands, stomach and liver—as observed by Heidenhaim, Langley and others. In the resting, and early stage of the functionating state, intracellular granules accumulate; to diminish and disappear as their substance contributes to the secretion of the glands.

The degenerative changes of nerve-cells resulting from toxic influences have also their analogies in other organs. Van Gieson reminds us that "The nervous system is built upon the same plan as other humbler and more simple tissues of the body, and furthermore, it behaves just like these other tissues and organs in its reaction to pathogenic agencies. The nervous system has no distinct pathological processes of its own without analogy elsewhere in the body"[5] . . . "The pathological processes in the brain in all its complex and bewildering morbid manifestations . . . are but few in number." "All the vast and varied manifestations of organic neural disease are due to degeneration, inflammation and necrosis . . ."

He compares especially the brain and kidney, which both have a parenchyma and stroma, and notes the analogous occurrence of acute parenchymatous degeneration in both organs from the action of poisons, "whether they be of the extrinsic, bacterial or autogenous class."

It may be noted that the variety of nervous disorders evidently has relation, not only to the great variety of functions belonging to different systems of cells, but also to their morphological and chemical variations, which are equally wide; so that a given poison may have chemical affinities for this or that system of cells, or for different portions of cell-structure in the cells of different systems.

The application of the foregoing results to the group of disorders under consideration is obvious.

[5] Trans. Am. Med.-Psych. Ass'n, v. iv, p. 167.

We have seen, through the investigations of Hodge, Mann and others, that nerve-cell fatigue is attended by a greater or less degree of chromatolysis. When fatigued nerve-cells are compelled to continue their function without proper intervals of rest, and neurasthenia or insanity results, we have still the condition of chromatolysis in a more intensified form.

If emotional strain is brought to bear with sufficient intensity and duration upon the brain-cell, either alone or joined with overwork, the same uncompensated exhaustion manifests itself in its internal structure, and appears outwardly in the form of hysteria, chorea, neurasthenia or insanity. If a substance, toxic to the nerve-cell, be introduced from without, like alcohol, acute or chronic chromatolysis may result; and may become manifest, according to the method and period of its use, and the individual idiosyncrasy, in multiple neuritis, mania a potu, neurasthenia, or insanity. If the substance toxic to the nerve-cell is generated within other tissues, or the blood, by faulty metabolism, we have the strongest analogical reasons for believing that the result so uniformly met with in all experimental poisoning obtains here also: and such has been demonstrated to be the case by actual observation.

It should also be borne in mind that the products of nerve-cell degeneration are themselves probably highly toxic.

The lesion in heat-exhaustion is revealed by the experimental work of Goldscheider and Flatau, Lugaro, Marinesco and Ewing. Of the changes produced by artificial elevation of body-temperature in rabbits and dogs, Lugaro makes the following statement, which strikingly corresponds with clinical observations. He says:[*] "A feature of the morbid change is that (unlike chromatolysis from most other causes) it is diffused throughout all the cells in an almost equal degree."

In correspondence with this fact, it may be mentioned that of thirty-seven soldiers and sailors of the Cuban and Philippine wars, admitted to the department in St. Elizabeth under the writer's charge, thirty-one were suffering from the confusional or stuporous type of insanity, the cause attributed to most of the cases being heat-exhaustion.

[*] Op. cit., p. 283.

The influences referred to as productive of chromatolysis—over-fatigue (including emotional strain), heat-exhaustion and toxic influences, are the chief immediate causes of neurasthenia and insanity, which present, in their early stages, cells exhausted of the element which supplies their functional energy; while, as the disease progresses, cells exist in various stages of advancing degenerative change.

Primary degeneration does not, of course, represent the whole morbid process in these disorders. The altered neural protoplasm is toxic to the blood-vessels of the part; and by irritation of their walls and the vasomotor nerves terminating within the latter, and perhaps by involvement of the vasomotor centers more directly, hyperaemia and stasis result, with nuclear engorgement of the perivascular and pericellular lymph-spaces of the brain.

Nervous impairment also secondarily involves the impairment of other organic functions.

These secondary and more obvious changes require appropriate treatment, but in the very early stages they have not yet become a prominent factor in the disease.

What indications, then, if any, do these important discoveries in the pathological histology of nerve-cells afford for the practical treatment of neurasthenia and insanity?

Regarding prophylaxis, much is to be said concerning measures for securing the development of a healthy and vigorous nervous system during the formative period of early life. This is a subject, however, whose importance and extent are such as to preclude its adequate discussion in a paper of this sort; and I therefore only refer to it to suggest its claims upon the medical profession.

Regarding treatment of the actual disorders, it is the physical morbid conditions which should determine the treatment far more than their psychological manifestations.

To direct our treatment to the latter, advising change of scene, travel or diversion of various sorts, is but treating symptoms, and in all cases of serious involvement will fail of substantial results. Physical exercise and active out-of-door life will too often only impose a new tax upon an already exhausted nervous system.

Moreover, the condition of life of many sufferers would not permit their use of these measures if they were desirable. Looking, then, to the actual condition of the nerve elements, its causation, and secondary effects, I think we may derive important aid in determining what treatment we should employ, and what we should avoid.

Time is evidently a most important consideration. As the disorder continues, degeneration, which at first involves only the functional element, extends to the fundamental structures of the cell, and its destruction results. Hence the demand for *early* treatment. I believe that the indications for treatment are best fulfilled through rest, forced nutrition, elimination, and the restoration of impaired vasomotor function; together with mental control and suggestion, through which the physician can derive important aid.

This plan is not new; but it does not seem to be accepted by the body of the profession in its entirety, as if we believed in it, and could give a reason for our faith. It is hoped that what has been here presented may be regarded as new evidence, strongly confirming a plan of treatment which has already the sanction of high authority.

With regard to the method of securing the objects mentioned, the Weir Mitchell method is the best, so far as it goes; combining rest in bed, over-feeding, massage and mild faradism. In some advanced or severe cases restraint in bed may be necessary; and this is usually best secured by such mechanical means as may best secure the ease and comfort of the patient. Rest in bed should be continued, not for days, but for weeks, until nutritive repair is well established.

As an additional means, and one by no means of secondary importance to any, I wish to call attention to *hydrotherapy;* a method hitherto but little used in this country, but whose value is happily beginning to be recognized. After a personal experience of six years in its constant use, with a large number of patients, I can speak confidently and emphatically of its usefulness. The varied methods of its employment make it a most flexible agent, and so give it a wide application. It stands alone in its class for efficiency in securing elimination of morbid substances through the natural channels; it aids nutrition by stimu-

lating the glandular organs to a healthy activity; it arouses the paretic vasomotor system, and restores the balance of vascular tension with a promptitude and certainty that no other agency is capable of.

I do not say that normal vasomotor function is perfectly restored in every case, for cell-degeneration may have rendered this impossible; but I believe that it will do all that can be done to this end, and more than can be done in any other known way. Under its influence the red blood-cells increase, and the percentage of haemoglobin. It relieves vascular and lymphatic engorgement through its equalizing effect upon vascular tension, and removal of fluid through the excretory channels. As a sedative in the state of nervous erethism which frequently prevails in these disorders it is invaluable. I forbear mentioning details regarding the methods of employing hydrotherapy; as such partial efforts cannot give a just or adequate idea of the principles upon which the practice rests. They are fully stated in the large body of scientific literature upon the subject, which it is the privilege of every physician to avail himself of. For this knowledge is of too general importance to be relegated entirely to specialists; it should, indeed, be taught in our schools, as it already is in some of the leading schools of Europe.

Drugs are of quite secondary importance in these disorders, and their use must, of course, vary with the individual cases. Tonics are often indicated, and disordered functions call for their appropriate treatment, though, under hydric methods, the occasions for treatment will greatly diminish.

Insomnia, at once the evidence of lost power of nutritional repair in the nerve-cells, and a most important factor in the extension of degenerative change, may require a carefully limited use of hypnotics.

The more active narcotics should not be used without due cognizance of the fact that each is capable of producing its own peculiar form of chromatolysis.

Especially is this true of the alkaloids of hyoscyamus, which are so effectual in calming cerebral excitement as to offer temptations to their use to a degree which may easily prove prejudicial to recovery.

Regarding the length of period through which treatment

should be extended we can only speak definitely of the minimal period.

Experimental observations above cited indicate that at least ninety days are required for repair to become complete, after active degenerative change has ceased.

It is customary at St. Elizabeth, after nutritive gain is well established, as indicated by gain in weight and general physical and mental improvement, to cause the patient to be taken out for exercise in the open air, for short but gradually lengthening periods, just preceding, and preparatory to, hydric treatment in the " douche-room," after which he returns to his bed.

After repair has become complete, or has reached its possible limit, recovery may be confirmed by out-of-door life with judicious physical activity and mental diversion; such as would have proved exhaustive and injurious during the progress of the disorder.

One suggestion remains to be made, which I hope may commend itself to the judgment of the profession, whose approval would go far to make it operative. It has reference to the treatment in a single institution of neurasthenia and insanity in their early forms.

The difficulties and disadvantages attending the home-treatment of neurasthenia and insanity are recognized by all. The physicians engaged in private practice who can give the necessary attention to direct and supervise the treatment of such cases, to the best advantage, are comparatively few; and only the wealthy can command the necessary environment to make such private treatment effective. The very great number of sufferers, of means too limited to obtain the exact treatment which will answer their need, through the trial of one expedient after another fritter away the early, hopeful period when arrest and repair are easily possible to the large majority, and either sink into chronic, hopeless, dependent invalidism; or, having reached the stage of deeper cerebral reductions, they are committed, unwillingly upon their own part and unwillingly on the part of friends, to a hospital for the insane, at a period of their disease when only to a minority is recovery possible.

Insanity is but an advanced and grave form of neurasthenia, in which the cerebral involvement predominates. In treatment,

the greater includes the less and is practically the same for both. I am speaking throughout of early insanity.

Would it not be of inestimable value to both classes of patients, if there were well-equipped institutions where they could be treated together, without delay, and without unnecessary inquiry as to whether the disorder had passed the shadowy, ill-defined limit, often arbitrarily determined, beyond which insanity is technically regarded as existent?

Such institutions might be under State or properly regulated private control. The latter would partake of the eleemosynary character of our general hospitals, where provision is made for paying and non-paying patients. If under State support, they would find justification in the hundreds who would be rescued from unproductive and burdensome dependence.

The furnishing of such hospitals should embrace a complete equipment with hydric apparatus, such as that devised by Dr. S. Baruch, with attendants, male and female, thoroughly trained in its use. The nurses, in addition to general training, should be especially educated for their peculiar duties, having been first selected with reference to their natural adaptability.

The hospitals should be arranged with reference to the diversion and light employment of convalescents, including suitable gymnastic apparatus, billiard-tables, etc., and should combine, in some degree, the features of a hospital and a home, with ample grounds for open-air recreation. Less adequate, but very useful provision for these cases might be made in wards attached to a general hospital; but the medical service should be continuous and there should be provision for continuous treatment for six months, if necessary.

Admission might be voluntary on the patient's part, with condition of remaining at least three months.

There would be practical advantages in favor of making such hospital a separate department attached to State institutions for the insane, with provision for voluntary admission.

Whichever method of establishment should most commend itself, the advantages over any establishments now existing are obvious in that those suffering from the milder forms of the disorder, of but moderate means, or without means, might secure the treatment urgently required; and those suffering from the

deeper forms of nervous reductions, or such as affect chiefly the cortical centers, might obtain early treatment and relief, without incurring the stigma which attaches to those who are committed to a hospital for the insane; and which often influences friends to defer suitable treatment until too late.

The following table, kindly prepared by Dr. G. H. Schwinn of the hospital staff, is intended to show the results of the treatment recommended, in fifty-three cases, whose duration was less than one year at beginning of treatment. The results are indicated in gain in body-weight, and in proportion of recoveries, or prospective recoveries. The list includes *all* such cases, revealed by a search of our records, treated in this department of the hospital during the last year.

Name.	Weight on admission.	Weight when discharged.	Present weight.	Number days in hospital.	Hydrotherapy used. No. of days.	Gain per month in pounds.	Result.
			Nov. 28				
A., R. A.	146	158½	.....	191	23	15.86	Recovered.
A., G. A. de	101	139½	.....	349	336	3.43	"
C., F. A.	144	139½	.....	230	119	3.83	"
C., P.	110	.....	129	282	246	2.34	Under treatment and improving.
C., R. E.	130	.....	160	318	207	4.40	"
C., T.	201½	.....	211	181	106	2.72	"
			Sept. 28				
E., J. Y.	135	.....	142½	57	55	4.14	"
F., H.	.....	.....	.....	123	57	.....	Recovered.
G., M. H.	123	142½	.....	91	74	7.80	"
H., C.	150	179	.....	227	118	7.47	"
H., J.	.....	.....	.....	203	93	.....	"
K., G.	115	.....	120	468	458	.33	Under treatment and improving.
K., L.	124	176	.....	264	242	6.53	Recovered.
K., W. H.	.....	.....	.....	147	124	.....	"
K., W.	.....	.....	.....	110	96	.....	"
M., W.	130	155	.....	171	163	4.66	"

Name.	Weight on admission.	Weight when discharged.	Present weight.	Number days in hospital.	Hydrotherapy used. No. of days.	Gain per month in pounds.	Result.
M., M.	131	.....	136	164	171	.88	Under treatment and improving.
O'D., T.	136	143	.....	262	192	1.10	Ran away.
P., J.	.....	.....	.....	239	229	.....	Recovered.
P., J. F.	.....	.....	.....	142	98	.....	"
R., R.	130	.....	137	243	229	.92	Under treatment and improving.
R., J. W.	133	152	.....	127	121	4.77	Improved.
R., R.	.....	.....	.....	98	52	.....	Recovered.
S., W. V.	.....	.....	.....	177	114	.....	"
S., A. C.	.....	.....	.....	114	41	.....	"
W., J.	121	.....	132	104	62	5.39	Under treatment and improving.
B., F.	168	.....	170	19	17	3.57	"
C., W. A.	180½	.....	185	19	17	8.94	"
G., J. E.	165	.....	169½	19	17	8.04	"
J., H. C.	142½	.....	144	19	17	2.68	Under treatment and improving.
R., T. H.	143	.....	149	19	17	10.73	"
S., E. L.	141	.....	151	19	17	17.88	"
S., J. E.	150	.....	155½	19	17	9.83	"
S., W. C.	150½	.....	151½	19	17	1.78	"
S., B. L.	152½	.....	161	19	17	16.99	"
T., W. L.	141	.....	143	19	17	3.57	"
T., F. A.	126	.....	134	19	17	14.31	"
A., W. S.	151	175	.....	283	272	2.68	Recovered.
A., T.	135	.....	183	180	177	7.97	Remaining under treatment.
C., E. T.	174	.....	186	266	174	1.96	"
E., W. K.	117	.....	134	267	234	2.20	"
F., D.	119	.....	130	251	249	1.34	"
H., J. C.	116	.....	124	29	18	13.51	"

Name.	Weight on admission.	Weight when discharged.	Present weight.	Number days in hospital.	Hydrotherapy used. No. of days.	Gain per month in pounds.	Result.
J., B.	126	.....	136	70	18	16.89	Remaining under treatment.
K., D. H.	109	.....	134	210	200	3.80	"
M., W. H.	134	.....	150	512	460	1.05	"
M., W. H.	112	.....	147	168	157	6.77	"
M., F.	129	.....	142	433	396	.99	"
M., W.	103	.....	147	227	208	6.43	"
S., C. H.	142	.....	148	242	127	1.43	"
S., S.	123	.....	149	169	162	4.88	"
S., C. S.	119	.....	132	501	470	.84	"
W., W.	116	.....	125	213	208	1.31	"

Recoveries: 17 discharged, 8 not yet discharged.*

13 under treatment less than one month.

53 acute cases.

44 with records of weights.

Average duration of treatment, five months; average gain per month, 5.65 lbs.

Four of the remaining fifteen cases are not likely to recover; one suffering from gross lesion of brain, two showing strong hereditary or congenital defects, and one being a morphinist who has already repeatedly relapsed.

One patient eloped.

Three other cases are doubtful; with the others there is a strong probability of recovery.

* At date of sending to printer (Dec. 20) five of this number have been discharged.

DIFFERENTIAL DIAGNOSIS OF PARETIC AND PSEUDO-PARETIC STATES.[1]

By ARTHUR W. HURD, A. M., M. D.,
Superintendent Buffalo State Hospital, Buffalo, N. Y.

In taking up the consideration of those conditions which resemble paresis but which are *not* paresis, one is impressed by the number of conditions in which sometimes a differential diagnosis is difficult. One reason, I believe, for the resemblance of several conditions to paresis, is that they have, many of them, a common ground-work, a common soil, which nourishes plants of a growth but little differing from each other. Dr. R. G. Wilson in the *Journal of Mental Science*, in 1892, calls attention to what he denominates the paretic diathesis. If, he writes, alcoholic abuse is a cause of paresis, why does it in one case produce ordinary insanity and in another paresis? If sexual excess is a cause of paresis, why does it produce in some melancholia and in others neurasthenia, in others paresis? Why does not masturbation produce paresis as often as it does melancholia or mania, whereas it appears to be a rare cause.

So varied are the assigned causes of paresis, that we may well ask ourselves if there is not some other common and general element entering into the problem. In looking over one's cases, I think one is struck with a resemblance, more or less close, in the general life, character and mental make-up of most paretics. And may not this paretic temperament be one of the determining elements which decides why, under similar conditions of excess, one man becomes a victim of locomotor ataxia or alcoholic dementia or melancholia and another of paresis.

Dr. Clouston has said that general paralysis is, as a rule, a certificate of general intelligence, and this may be true of the

[1] Read at the Annual Meeting of the American Medico-Psychological Association, New York, N. Y., May, 1899.

higher classes. But in whatever class we find the patient, we are apt to find the so-called paretic diathesis, if it can be so closely defined, to be outwardly manifested by a careless, an active and energetic character, by the man who is a *bon vivant*, who believes in having the good things of this life in abundance, without much regard to morals, the consequences or the future. He would be in a measure a representative of the so-called sanguine temperament, the self-indulgent, the good-natured man about town, generous to others as to himself, but without much self-restraint as to his appetites. It is difficult in a word to draw the picture of the man most likely to develop paresis, but we all have it in our minds whether we think of our own individual cases, or think of the military or the legal or the medical profession or the stage, all of which contribute so liberally of its members to this disease.

Now of the several forms of disease of which I shall speak as presenting resemblances to paresis, there are two, viz., cerebral syphilis and insanity of alcoholic origin which, all are agreed, are the two most frequent states which we shall be called on to consider. And these two are the ones, in my estimation, which in life and character previous to the appearance of disease, present the features which Dr. Wilson has so well described under the term of the paretic diathesis. In fact they are the kind of cases which are the ones most likely to develop paresis,—the frame-work or ground-work is the same,—the influences acting upon them are largely the same,—the causes of their alienation are also causes which are active in causing paresis, and consequently, to me it is not strange that they produce resemblances to paresis so strong as to make the diagnosis often difficult. The foundations being so similar, it is but little wonder that the superstructure presents marked resemblances, until the building reaches such a point of completion that the differences of detail are manifest.

Another consideration, it appears to me, latterly has arisen which seems to increase the number of cases of doubt. The paretic cases, with the classical symptoms well marked, grandiose delusions and all, are not the ones that give us the trouble, so much as the melancholic and demented types,—and here it is, where the increase of doubtful cases arises; for not only in my

own experience but in that of others with whom I have talked, there seems to be a change in the character of the paretic admitted to our hospitals now, as compared with ten years ago,—the proportion of melancholic and demented cases seems to be increasing as compared with the typical cases, with grandiose delusions. In this I may be mistaken, but it is my individual impression and belief, and I may say corresponds with the experience of others.

Considering now some of the cases in which we are called on to make a differential diagnosis, I shall first mention the mental condition of chronic alcoholism. Here it is the depressive and demented type of paresis, which most closely resembles the mental state resulting from chronic alcoholism. When paresis is the result of excessive drinking, the symptoms may easily be so blended that time is necessary for an elucidation.

The motor symptoms in paresis are generally more localized than in alcoholic dementia—the seats of election at first being more especially in the muscles of locomotion and articulation, while in alcoholism, the tremor and trembling are more generally distributed; with the general tremor, real muscular weakness is more marked than in paresis. In the early period, the trembling of the hands is much more conspicuous than in paresis, while the incoördination is apt to be less.

The interference with the muscles of articulation, while possibly present in both, is more pronounced in paresis, and the elision of syllables, the omission of syllables or letters, quite characteristic but difficult to describe, is more pronounced,—while in alcoholism, the difficulty of articulation appears to be a more constant general tremor of the muscles, without the lapses and spasmodic pauses.

Headache, hallucinations and anæsthesia are more frequent in alcoholism. In the mental state the delusions of the alcoholic are apt to be those of fear, persecution, infidelity of wife and of friends, with active mental suffering. It is true that in paresis of the melancholic type, they may be present also, but they are less sustained, coherent and logical, and more easily divertible. The alcoholic complains frequently and continuously of his sufferings, detailing his pain of head, of limbs and stomach, while the paretic, even of the melancholic type, is more philosophic

in his woes, and often shows the fatuous contentment and indifference which at some time characterize almost every case of paresis. The pupillary changes may be of little help if the case of paresis happens to be one in which they are not particularly marked. Of course convulsive phenomena are of assistance when present, though there may be a history of epileptic attacks in alcoholic cases also, the exact nature of which it may be difficult to interpret from the account of friends.

The history of the case, the age of the patient, the delusions, either grandiose or depressive, may not always give us assistance, for they may so frequently correspond; yet a study of the motor symptoms, the differences in distribution and degree of ataxia—the persistence of fixed states or changeableness and occasional fatuity and indifference, will usually so combine with the motor symptoms or the progress, as to usually clear up the diagnosis within reasonable time. And yet we must be cautious, for some of the cases diagnosed as insanity of alcoholic origin may, after a period of great improvement or even apparent recovery, come back to us after a few months with paresis well marked. Whether such cases are paresis from the beginning or whether the first attack, be it of alcoholism or acute mania or melancholia, simply prepares the nervous system so that it readily undergoes the degenerative changes of paresis, prepares the way for it in fact, is a question undecided, though the fact remains.

We now come to the consideration of the diagnosis of cerebral syphilis, as compared with that of paresis, a much-vexed and long-discussed question.

This subject has not only been extensively studied abroad, but formed the topic of a full and interesting discussion at the International Medical Congress in Washington in 1887. Certain postulates seem to be fairly agreed upon by most alienists —first, that syphilis may be the cause of any of the simple psychoses, aside from general paralysis; secondly, that syphilis may cause true general paralysis of the insane; thirdly, that it may exist without true paresis, but cause a train of similar symptoms which the French, particularly, have denominated "Pseudo-Paresis." That it may cause the first-named group is generally admitted, just as any form of illness may cause mania,

melancholia or dementia. Secondly, that it may be, from the study of long series of cases, the cause of true paresis, classical in all its symptoms, stages and clinical history, seems proved. The third division is what principally concerns us here.

There may be many cases in which the clinical picture of paresis is somewhat toned down, and others in which the paretic symptoms of cerebral syphilis are somewhat heightened—that is, the two diseases approach each other and sometimes intermingle. That there are differences, I believe to be the case. Fournier somewhat rigidly distinguished between the two, but I believe later, somewhat modified his view and declared that many of the cases which he had formerly called pseudo-paresis, he now regarded as true paresis.

Even allowing, however, for those cases which so closely approach paresis as to lead some observers to deny practically any difference, there are others which, in their course and termination, vary so much as to be distinguishable.

No consideration of this subject could be properly made without acknowledging the classical work of Dr. Mickle. He calls attention first to the difference of the mode of onset, and points out the fact that in specific disease, marked motor disorders often precede the mental symptoms, while in paresis the reverse is usually the case. Further, it may be ushered in by a temporary hypochondriacal or acute delirium, whereas in paresis, there is usually a more prolonged stage of change and alteration in disposition, tastes and habits. Early paralyses of some of the ocular muscles, with difficulties of eyesight, optic neuritis, etc., often characterize specific cases. Headache, nocturnal, deep and very persistent and urgent, is much more common in specific cases. Local anæsthesia, vaguely distributed, and neuralgia, are often more pronounced. There are also differences in the general appearance and in the apparent condition of nutrition in the two cases.

The paretic in the early stages, is usually of a fairly good color, and does not show the marked anemia and ofttimes low cachexia of the syphilitic case in the early stages. In specific cases there is sometimes a variety in the associations of symptoms and an irregularity in their appearance, which is not characteristic of the fairly regular progress and progression in paresis.

It is true that in paresis the fibrillary twitchings of the tongue or facial muscles, and the hesitancy of speech, may be but imperfectly developed, and as these are less marked in the specific cases than in the paretic, in their full development, little help may be derived from these. Yet in the fully marked paretic, the ataxia of speech and the fibrillary tremblings and twitchings are usually more pronounced. Also in syphilitic cases the tremors and twitchings are more of a paralytic nature, and have less of the ataxic in their character, and are not so much in the nature of incoördination. Local muscular contractions and rigidities are much more common in specific cases, and after convulsions the paralyses in paresis are usually of an evanescent transient character, but in specific cases are apt to be much more persistent and more in the nature of true paralysis.

The motor impairment in paresis is usually much more general, less localized and irregularly progressive, while in syphilis, it is frequently a true paralysis, more localized and apt to be unilateral and constant. Furthermore, while delusions of grandeur and well-being, in fact those of the expansive type, sometimes occur in specific cases, they are less pronounced than in those of the well-marked paretic, though they may be as marked as in the less pronounced cases. The dementia and loss of special senses are apt to come on earlier and rapidly.

The feeling of well-being and of complacent groundless satisfaction with himself and his surroundings, manifesting itself in manner and facial expression, is a strong characteristic feature in paresis, and much insisted on by Regis as a diagnostic point.

This condition of *bien etre* may be obscured somewhat in depressive cases, but at some period is pretty sure to show itself. I can summarize in no better way, than to quote from the table published by Mickle on this subject, the points which distinguish this form of trouble from paresis.

a. The distinct history or symptoms of syphilis.

b. The preceding cranial pains, nocturnal and intense.

c. The exaltation, less marked, less persistent, and perhaps less associated with general maniacal restlessness and excitement, than in most of the cases of general paralysis.

d. Sometimes such complications as palsies of one or several cranial nerves, or hemiplegia, or paraplegia having the character and course of syphilitic palsies.

e. The greater frequency of optic neuritis, early amaurosis, deafness, local anæsthesia, vertigo, or local rigid contraction.

f. The affection of articulation, paralytic rather than paretic, and usually the speech which is not accompanied by any facial or labial tremors or twitchings.

g. A frank cerebral or spinal meningitis or pachymeningitis.

h. The variety of the motor and sensory symptoms.

i. The effect of anti-syphilitic treatment.

One of the strong points of differentiation remains to the last, and that is the variation in the course of syphilis, the prolongation of the disease beyond the average true paresis, and the different results of specific treatment in cases with an avowed specific history, and with lesions apart from the cerebral. And Regis has so well expressed the moderate ground in this question that I may be pardoned for a quotation.

"It follows from these data that the majority of authorities admit, under one form or another, a specific pseudo-general paralysis, separated from true general paralysis especially by clinical differences, which can be summed up as follows: Dementia less pronounced; habitual melancholic delirium; delusions of grandeur less frequent, more coherent; less embarrassment of speech, rather paralytic than ataxic; tremor of lip and tongue often absent; motor disturbance of paralytic order more frequent; course more irregular; duration longer; recovery possible. If we except the particular features relative to the course of the disease, its duration and termination, which are both pathognomonic, we do not believe that there exist any very evident differences between the two conditions as regards morbid phenomena. In any case, the differences are neither constant nor important enough to legitimize such a purely symptomatic differential diagnosis as has been attempted, and in this matter we agree with the lamented A. Foville, who thought that the term syphilitic pseudo-general paralysis should be reserved for cases where different lesions have given rise to symptoms like true paresis. To be able to say 'pseudo-general paralysis' there ought in fact to be similar symptoms, at least the essential ones should be the same; and lacking this the term pseudo-paralysis has no further *raison d'etre*.

"Without troubling one's self with more or less problematical

shades of difference between the symptoms of the two disorders, the designation syphilitic pseudo-general paralysis may therefore be reserved for those specific cerebropathies, which, while clinically similar to general paralysis, differ absolutely from it as regards their course and prognosis, and consequently in their lesions. True paresis has a progressive course, a fatal prognosis and incurable lesions. The pseudo-paresis, whether it be infectious as when from syphilis, or toxic as in alcoholism, has a regressive course, a relatively favorable prognosis, and curable lesions. Whenever this triple condition of regressive course, favorable prognosis and curable lesions is realized in a morbid condition similar in symptoms to general paralysis, we may apply to it the name of pseudo-paresis. It is thus we distinguish for ourselves, the pseudo-general paralysis in general, and that from syphilis in particular. Although the term pseudo-general paralysis itself is unacceptable, nothing is more easy than to consider those conditions as general paralysis, but as special forms, to which may be applied the adjective regressive, in opposition to genuine general paralysis which is essentially progressive.

"However it may be considered, syphilitic pseudo-general paralysis may present itself under any form, demented, depressive or expansive. The characteristic peculiarity, whatever may be the form, is that the symptoms rapidly attain their greatest intensity, and that sometimes the patients are demented and filthy from the very beginning. Then after a certain time, especially under specific treatment, the symptoms are observed to improve, by degrees, and there occurs an evident amelioration, or even a genuine recovery takes place. When we see, therefore, in a syphilitic subject, with or without a prodromic apoplectic attack, a very rapidly appearing and profound dementia with paresis, accompanied or not by delusions, we should be on our guard for a syphilitic pseudo-paresis, and institute at once an appropriate course of treatment which will often be successful. As to the lesions of syphilitic pseudo-paresis, they cannot always be determined on account of the relative curability of the disorder, but from the fact that they are not irremediable, we may assume that they are usually neoplasms of rapid evolution, acting by compression on the mass of the brain."

Another condition, in which sometimes a little element of

time is necessary to clear up the diagnosis, is one which, though not often spoken of, has come under my observation in a few instances, and that is a condition of profound nervous exhaustion coming on in brain workers, after a period of intense application. This form, however, is not likely to be confused with the expansive elated condition of paresis, nor follow its course, but in its initial stage it sometimes simulates the depressive very well. In this, there is usually a history of intense mental application and worry in a highly-strung neurotic individual, which results in a complete nervous breakdown, with insomnia, tremors of speech, ataxia of gait, inability to concentrate the mind, with some depression. These conditions, in their muscular tremors, in hesitancy of speech and in confusion, sometimes closely simulate paresis of the depressive type. The history of the trouble, however, the association of symptoms, and above all, the progress, serve to clear up the diagnosis.

Another condition which at times represents considerable difficulty in diagnosis, is that of acute mania as contrasted with the acute maniacal excitement of paresis. In both there may be extravagant delusions, restlessness, excitement, tremors of speech, and twitchings of the muscles of the face and tongue. There are some cases of acute mania in fact in which these may be extremely well marked, and with a history of irregular living and changes in disposition, may make for a time positive diagnosis between the two impossible. As a rule, however, in acute mania there are less mental confusion and less tremor and twitching of the face and ataxia of speech than in paresis, though not always.

Some observers have emphasized the fact that there are apt to be more mental confusion and less coherence and persistence in the mental state of the paretic, than in a case of acute mania and a feeble mental condition which is much more easily diverted from its train of thought and expression.

But as a rule a moderate amount of time will be of great assistance, for the acuteness of the attack usually passes off, and with it the motor symptoms mentioned, if it is a case of acute mania, but with the motor symptoms persisting if it is true general paralysis.

In cases of cerebral tumor, much that has been said of cerebral syphilis may apply here, in diagnosis. There are apt to be

evidences of tumor, compression and paralysis of special nerves, headache, vomiting, symptoms both of motion and sensation, which point to definite cerebral localization; and paralysis rather than a paresis, usually an absence of speech-affection, blindness, and with progressive mental failure and true dementia without grandiose delusions.

In dementia with paralysis there may be a resemblance to the depressive form of paresis, sometimes quite striking. However, the order of events is usually quite different in dementia with paralysis. A history of an apoplectic comatose attack, followed by paralysis, and this in turn by dementia, which is usually more limited in its scope and extent than in paresis, which relates to certain orders or classes of events, usually of early life and less general than that of paresis. However, there may be with this a hesitancy of speech and tremors, which simulate general paralysis. The age of the patient and the order of appearance of symptoms, usually are of assistance in differentiating.

In those few cases of disseminated sclerosis and locomotor ataxia, in which there may be a resemblance of symptoms to paresis, a history of the case, with the order of progression, usually serves to differentiate.

In these cases, the physical symptoms characteristic of the disease, precede the mental affection. The length of the disease, the freedom from mental implication for a long period, serve to distinguish; the later implication of the brain, by extension possibly, may bring on paretic symptoms, which may be, I believe, a true paresis, in which all the classical symptoms are present. They eventuate by an extension of the sclerosis, or by reducing the general resistance, in such a process of cerebral degeneration, as to produce practically the symptoms of a true general paralysis of the insane.

Of certain forms of senility which have been mentioned, we will not extend this paper unduly to speak. In these, however, the order of symptoms, the age of the patient, and the history generally, usually serve to differentiate, although there are a few in which there may be considerable resemblance of symptoms.

Another group of cases, none of which have come under my personal observation or knowledge, however, are reported by Dr. Musso of Bologna in 1887. In these, a slow form of car-

bonic oxide poisoning produced, in five cases, symptoms very strikingly like those of general paralysis. Four of the cases were men-cooks, and the fifth a seamstress, all of whom had inhaled carbonic oxide constantly from burning charcoal. The motor symptoms, tremors, etc., were present in all; the inequality of the pupils in three of the cases, and this, with mental dullness and occasional paroxysms of excitement, presented a picture strikingly like certain cases of paresis. The course however differed.

Another form of trouble, of which mention may be briefly made, and which it is curious to note and sometimes difficult to differentiate without knowing the history, are cases of mania occurring in patients who have defective articulation from some impediment in speech, especially if the case is one in which there are expansive delusions. However, the absence of other symptoms, as of pupils, tongue, gait, handwriting and progress, will serve to differentiate, though if the previous defect is not known, sometimes with considerable difficulty, as Mickle has pointed out.

Lead-poisoning has been credited by some observers with causing true general paralysis of the insane, typical in its delusions, and course. However this may be there *is* a form of cerebral disturbance, not uncommon in chronic lead-poisoning, which resembles paresis only in part. There are, of course, the muscular weakness, the palsies and the tremblings, and oftentimes melancholia with delusions, and inequality of the pupils, etc. But if the lead line upon the gums is present, if there are wrist-drop and other paralyses, with a history of colic, all appearing *before* the mental symptoms, together with confirmatory evidence that lead is *entering* the system, and, by examination of the excretions, that lead is *leaving* the system, there should be little doubt, in those few cases, in which one may suggest the other.

In attempting to review so broad a subject in this brief space of twenty minutes, I feel that I have committed many sins of omission, necessarily. But I have tried to point out some of the common every-day landmarks which should guide us. When all is said and done, however, it must be remembered that we are frequently placed in a position where justice to ourselves

and the patients' friends, demands a withholding of positive prognosis, and it is better to be too cautious in many cases, than to be rash in one. To have one case, condemned by fatal prognosis, show lasting improvement, if not complete recovery, contrary to all our prognostications, may result in our discomfiture, and the patient's injury. And in such doubtful cases, it is best to defer for a period to Time, which is not only the best healer of all sorrows, but the best diagnostician in the profession.

A CASE OF MULTIPLE CEREBRO-SPINAL SCLEROSIS OF A SPECIAL ANATOMICAL FORM, WITH A HISTORY OF PRONOUNCED FAMILY DEFECT.[1]

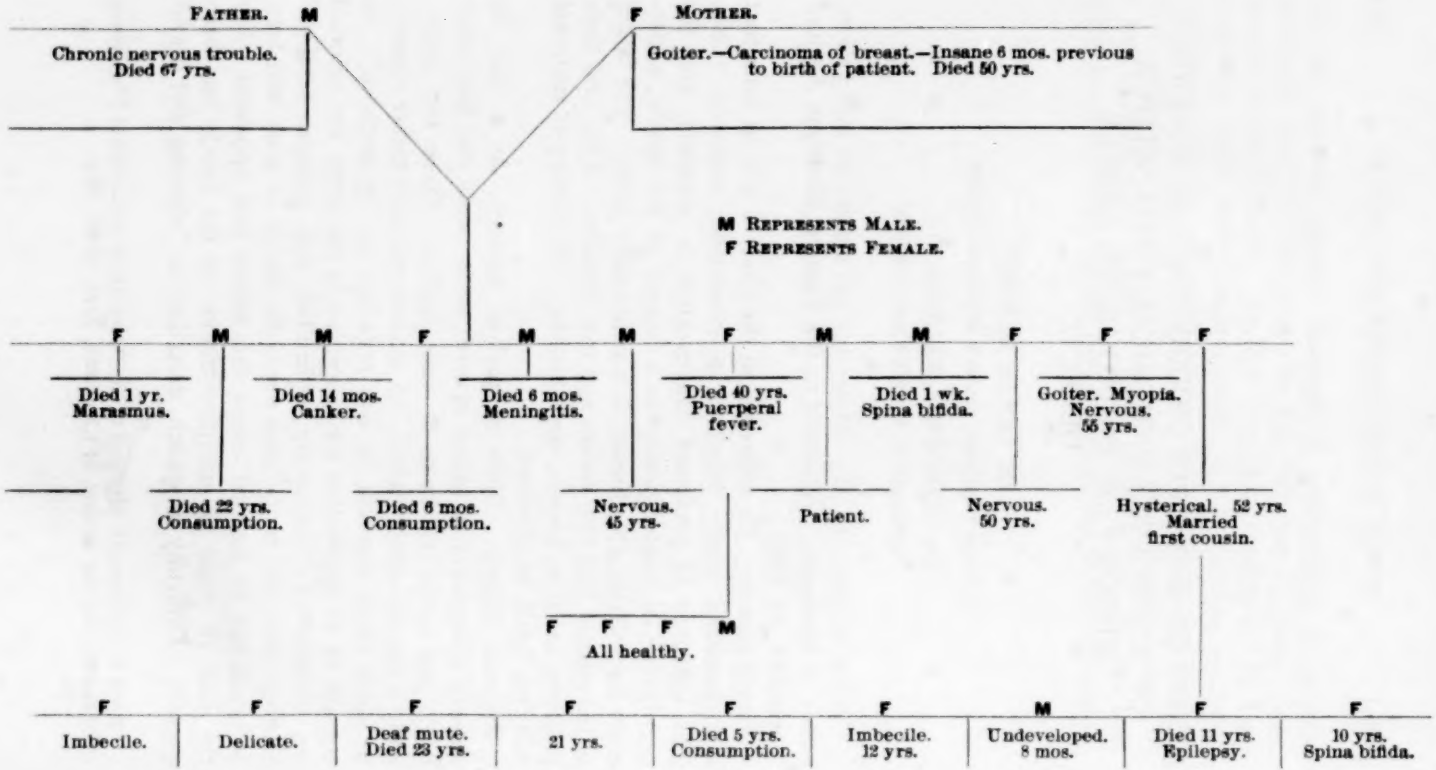
By Dr. IRWIN H. NEFF,
Assistant Physician, Eastern Michigan Asylum;
Dr. THEOPHIL KLINGMANN,
Pathologist to the Michigan Asylums.

Clinical history: C. W. Male; age 52; single; no occupation; native of Michigan. Admitted to the Eastern Michigan Asylum November 30, 1895.

Family history: By reference to the chart it will be seen that a pronounced family defect of an interesting character exists. The influence of profound degeneration is apparent, and the occurrence of consanguinity in a branch of the family, apparently intensifying the disease, is a noteworthy point. The father of the patient had two sisters and two brothers. They and their progeny, as far as known, were healthy. No history of maternal relatives could be obtained.

Personal history: Birth of patient normal. As a boy he showed clumsiness in motor sphere: never could run like other boys, and could not learn to write legibly. There was apparently a psycho-motor defect. All movements were rather clumsy; in many other respects he was regarded as "precocious." At the age of 21 application for a position in the army was rejected on account of "locomotor difficulties and general debility." Shortly after this he became markedly ataxic in arms and legs. It could not be learned where this ataxia first appeared. For the past 18 years an intention-tremor of the hands has been present. Difficulty in speech, described as "slurring and drawl-

[1] Read at the Seventh Meeting of the Association of Assistant Physicians of Hospitals for the Insane, at Cleveland, Sept. 26-28, 1899.


FATHER. M
Chronic nervous trouble. Died 67 yrs.
F MOTHER.
Goiter.—Carcinoma of breast.—Insane 6 mos. previous to birth of patient. Died 50 yrs.
M REPRESENTS MALE.
F REPRESENTS FEMALE.
F Died 1 yr. Marasmus.
M Died 22 yrs. Consumption.
M Died 14 mos. Canker.
F Died 6 mos. Consumption.
M Died 6 mos. Meningitis.
M Nervous. 45 yrs.
F Died 40 yrs. Puerperal fever.
M Patient.
M Died 1 wk. Spina bifida.
F Nervous. 50 yrs.
F Goiter. Myopia. Nervous. 55 yrs.
F Hysterical. 52 yrs. Married first cousin.
F F F M All healthy.
F Imbecile.
F Delicate.
F Deaf mute. Died 23 yrs.
F 21 yrs.
F Died 5 yrs. Consumption.
F Imbecile. 12 yrs.
M Undeveloped. 8 mos.
F Died 11 yrs. Epilepsy.
F 10 yrs. Spina bifida.

ing," exaggerated on any excitement, has been present for the same time. Mental defect has been noticed since the patient was 13 years of age. During the past five years he has had difficulty in walking, and for the past two or three years has been unable to stand unsupported, and has progressed from place to place on hands and knees. With the exception of some chronic eye-trouble and habitual constipation, during childhood, there has been no history of any physical disease. No history of any infective trouble could be obtained.

His psychical condition at the time of admission to the asylum was described by the certifying physician as follows: "All mental faculties appear weakened. He has lost all idea of locality and identity. Explosions of irritability frequently occur, with the usual symptoms of a secondary dementia."

Status presens: Anthropometrical measurements and the examinations show the following physical stigmata of degeneration: Head large, circumference 57 centimeters; skull dolichocephalic. Marked asymmetry of cranium, viz., bulging in right occipital region. Asymmetry of face: left side broader, and left malar bone more prominent. Prognathism. Irregularity of bicuspids and upper and central incisors. Malformation of thorax (pigeon breast). Lower lip hypertrophied and protruding. Vault of palate unusually low. Right alveolar arch higher than left. Lobules of both ears unusually pendant and bifurcated. Darwinian tubercles present. Hypertrichiasis. Hair all over body coarse and wiry. Angular curvature of spine in dorsal region. Round-shouldered.

All movements of eyeballs possible. No inco-ordination or motor disorders. Right pupil is irregular, having the appearance of old adhesions. Reaction of right pupil sluggish and partial. Left pupil is regular in outline, with a normal pupillary reflex to light and accommodation. Visual acuity and fields, roughly tested, normal; ophthalmoscopic examination impossible on account of resistance of patient.

Muscles of face well developed; action asymmetrical. Coarse tremor, increased on volition, involving the lower facial muscles. The tongue is large and flabby, and a coarse tremor is constant. The upper movement of tongue is restricted on account of adhesions of frenum.

Speech is thick, slurred, and markedly tremulous. All disorders are increased by any emotion, or by volition. Syllables are often elided. Abnormalities of speech are exaggerated on rapid articulation. Movements of arms are imperfect, and finer movements of fingers impossible. Muscularity is poor, and there is a distinct atrophy of interossei and thenar muscles of both hands. The flexors and extensors of both fore-arms are flabby. The middle and distal phalanges of both hands are in a condition of flexor spasm. A coarse intention-tremor is present in both hands. Comparative measurements of arms show no differences. No objective sensory changes.

All muscles of the legs are flabby. There is a coarse tremor, increased on movement, but less marked than in arms. While the legs are at rest coarse fibrillary contractions of extensors and flexors are noticeable. Both feet are inverted and in a condition of talipes equino-varus. Gastrocnemii are in a condition of tonic spasm. There is a perforating ulcer about the size of a nickel on the dorsal surface of the second toe of the right foot. Bursæ are present over both patellæ. The knee-joints are enlarged. Measurements show a similar condition in each leg. There is inability to flex and extend the legs or feet to a normal degree. No disorders of sensation could be demonstrated.

Patient is unable to stand unsupported, and there is marked swaying, denoting ataxia and vertigo. This swaying is irregular, with a tendency to fall forward. If unsupported the patient often falls.

Reflexes: Knee-jerks absent: plantar, cremasteric and abdominal reflexes not obtained. Wrist- and elbow-jerk are absent. Muscular reflexes present, but subnormal.

Electrical examination: Right arm, faradic: deltoid, biceps and triceps respond normally. Median and ulnar nerve-excitability below normal. Contractions of flexor and extensor muscles of fore-arm subnormal. Interossei and muscles of the thumb and fourth finger do not reply. Galvanic: muscles of upper arm respond normally. Minimum current 3 milliamperes. Flexor and extensor muscles of fore-arm show sluggish reaction to minimum current of 4 milliamperes. Median and ulnar nerve-excitability below normal. No reaction of interossei or muscles of the thumb and fourth finger.

Left arm, faradic: contraction of flexor and extensor muscles of fore-arm sharp and to a lesser current than in right arm. Otherwise muscle and nerve-reactions correspond to right arm. Galvanic: same condition of hand-muscles as in opposite hand. Flexor and extensor muscles respond more sharply and to a lesser current than in right arm. The nerve-excitability appeared normal.

Legs, faradic: reaction of muscles of both legs below normal. All muscular reactions were indicative of quantitative changes. The tibialis anticus and extensor pollicis of each leg do not respond to galvanic or faradic current. Nerve-excitability appeared diminished.

Face: stimulation of both facial stems gave normal reply. Muscles of face respond in a normal manner.

Psychical examination: Indications of general mental enfeeblement, with a degree of egotism. Patient expresses unsystematized ideas of persecution. Expansive religious ideas present. These, too, were unsystematized.

Examination of thoracic and abdominal viscera negative. General nutrition appeared defective, and there was evidence of fecal impaction of sigmoid flexure. Urinary incontinence present. Examination of urine was indicative of chronic cystitis.

Subsequent examination confirmed above symptoms, and no marked alteration was noted until a week previous to death. Mental symptoms were those of terminal dementia, with episodical attacks of irritability and elation. Incoherence of a passive type was present. The emotional tone was variable. There was marked amnesia for recent and remote events. Unsystematized religious and persecutory ideas continued. Patient often endeavored to stand, and on several occasions fell, inflicting severe bruises upon himself. Cystitis with urinary incontinence was constant. On May 25, 1896, there was evidence of pneumonia involving left lung. Symptoms of exhaustion rapidly developed, death occurring June 3, 1896.

Clinical summary: The direct history of hereditary taint and the manifestation of psycho-motor defect at an early age; at the age of 34 development of general tremor; speech-defects, and a disturbance in gait; the presence of spasm and ataxia in arms and legs; trophic symptoms; symmetrical muscular atrophies,

with electrical changes; angular curvature of the spine, double talipes equino-varus, and stigmata of degeneration.

On analyzing the case we find many interesting features. The physical stigmata of degeneration, the trophic symptoms, muscular atrophies, with electrical changes, occurring with some of the cardinal symptoms of multiple sclerosis, certainly show that we have an atypical case. It would appear that the mental symptoms occurred during early childhood, and therefore appeared before the onset of the nervous disease.

Gowers ("Text-book of Nervous Diseases") says that system-degenerations can be combined with insular sclerosis, and he believes that there is an analogy between these system-degenerations of early life, such as heredity, ataxia, and those cases of insular sclerosis occurring in young adults. The same author believes that muscular wasting and trophic symptoms are rare complications, and thinks that the symptoms of tabes which are sometimes found are due to a patch of sclerosis in the posterior columns. Bastian ("Paralysis; Cerebral, Bulbar and Spinal") says that in some instances there may be an extension of the sclerosis to the gray matter of the anterior cornua, leading, among many other phenomena, to muscular atrophies. Buzzard has called attention to a case in which muscular atrophies and varying electrical reactions occurred, disappeared and returned. Many interesting facts regarding the etiology of multiple sclerosis have appeared within the past few years. A few, bearing on the case, will be cited. Mendel thinks that there must be an endogenic or congenital predisposition to the disease. Strümpell (Neurologisches Centralblatt, 1896) is inclined to regard multiple sclerosis as an endogenic process, having its origin in congenital formation. Sachs, in a critical digest of multiple sclerosis (Journal Nervous and Mental Diseases, May and June, 1898), in discussing the etiology, believes that there are several and equally important causes which may give rise to multiple sclerosis. He is inclined to think that in a number of cases, particularly those occurring in early life, some slight defect in the original development of the central nervous system must be held responsible for the disease, and that the other factors must be regarded as exciting causes.

The case reported would seem to show a congenital defect in

the central nervous system, and the slow development of the disease, beginning at the age of 21, would suggest an irritation which might have resulted from infection. The absence of any history of traumatism, of infective disease, or even of syphilis, might permit us to regard the habitual constipation which had existed from early childhood as a possible source of autoinfection. It should be remembered that this was found at the autopsy to be due to obstruction resulting from a mesenteric band. It is also not improbable that the renal and vesical changes might have given rise to a condition of toxemia. Although these kidney and bladder changes may have occurred late in the disease; they may have aggravated the trouble.

The case shows an analogy to other system-diseases occurring in a degenerate, viz., an inherent defect in the nervous system, on which is founded a degenerative nervous disease, the latter resulting probably from some irritation, possibly autoinfection.

Other questions regarding the causation merge into the pathogenesis of the disease, and can be more satisfactorily discussed after the pathology has been considered.

Pathology.

With the exception of some opacity of the dura-mater and arachnoid, no marked change was found in the coverings of the brain and spinal cord.

The brain appeared normal in consistency, weighing 39 ounces; the cerebro-spinal fluid was in excess. Slight atheroma of the arteries at the base of the brain. The gross pathological changes in the brain were easily recognized by the naked eye (Fig. 1), and consisted of numerous patches and nodules of sclerosed tissues located largely in the motor region of the brain (Fig. 2) and lateral tracts of the spinal cord (Fig. 3); very few nodules were found scattered throughout the brain and cord. The nodules varied in size from mere microscopical portions to that of a pea, rounded or irregular in shape, and appeared on the surface as slight prominences of a gray color, translucent and having a firm consistency. Some of the nodules were softer than normal tissue and were distinctly circumscribed. The microscope revealed, however, that they merged imperceptibly into the normal tissue; they were quite distinct, though in the motor region of the brain

there were some that blended into each other. The smallest nodules were found in the brain; all those in the spinal cord were larger and of much longer standing. None of the sclerosed parts extended from the white substance into the gray. The lesion was most pronounced in the white matter below the cortex of the motor area. In a sagittal section through the hemispheres the lesion could be traced through the internal capsule into the crus cerebri. There the lesion was most marked in the pes occupying the central and larger portion of the crus and maintaining this position along the crus it was traced into the pons, where the nodules were well scattered throughout a transverse section of the pons but more thickly settled in the center (Fig. 4). Following it backward the lesion extended into the pyramids and thence downward into the cord, where it occupied the lateral portion of the cord, most extensive in the cervical region, but becoming more superficial and the nodules diminishing in size and number as it passed downward, the sclerosis being entirely absent below the lumbar swelling, although some degeneration of the nerve fibres was found below this point.

In the cerebellum the sclerosed nodules were gathered around the corpus dentatum (Fig. 5), as well-formed and distinctly-circumscribed small gray masses. The lesion in other parts of the brain was of a different character, secondary to the sclerosis and of minor importance, and may be considered as occurring in the terminal stage of the disease.

The vascular system was apparently normal, although there was some slight thickening of the walls of the median basilar artery. The smaller branches forming the circle of Willis were in a perfectly normal condition. The middle cerebral and its branches, which were carefully traced to the arterioles and microscopical filaments were without pathological change; the walls of the vertebral arteries were slightly thickened but not sufficiently to cause interference with the circulation. The small arteries in the pia-mater, and those leaving the pia-mater to dip down into the substance of the brain, were absolutely free from any morbid change. The arterial system of the spinal cord was well preserved in its normal state, and no disturbance of the circulation could be accounted for there.

In addition to the pathological changes in the central nervous

system there were other morbid processes in different parts of the body. On examination of the chest a marked swelling below the left nipple, an inch from the median line, was found which proved to be an encapsulated abscess at the junction of the fifth rib with the cartilage. The rib was transversely fractured and necrosed. There had been a fracture of the sternum at the juncture of the third rib with necrosis at the line of fracture. The left lung was in a condition of consolidation. The intestines were distended. There was a constriction of the last third of the ileum by a mesenteric band causing a considerable diminution in the lumen of the intestine. An impaction of feces in the large intestine extending to the transverse colon was present. The bladder walls were roughened, the kidneys were congested, the spleen and other viscera were normal.

The smallest sclerosed nodules were found in the brain, and the smallest particles could scarcely be differentiated from the normal tissues. Under the microscope they appeared lighter, more transparent, and did not take on the stain so deeply, while those in the spinal cord were larger, distinctly circumscribed, denser and stained deeply. The larger patches were masses of fine granules, and when teased apart were found to consist of very fine fibres and small glistening granules, the periphery of many patches presented more or less numerous granular corpuscles, which indicated that the morbid process was still active. The smaller patches contained granular corpuscles both at the center and the periphery, in other words, recent patches of disease. In addition to the patches presenting the usual appearance of disseminated sclerosis, there were in some parts of the brain and cord, areas in which there was marked cell-infiltration in the tissues immediately surrounding the blood-vessels. These patches the authors regard as a result of circulatory changes occurring in the last stages of the disease.

Both small and large nodules in the brain and cord were entirely independent of the blood-vessels. The vessels did not show any change in the areas where sclerosis was most marked, although some of the blood-vessels were dilated the chief change in the vessel wall consisted in cellular infiltration in other than sclerosed areas of the brain; also an abundant immigration of leucocytes occurred into the surrounding tissue. The leucocytes

were not increased in size; they did not become changed into connective tissue but degenerated; they probably exerted an injurious influence on the vitality of the nerve-fibres, but they could not be regarded as the chief cause of the metamorphosis.

Charcot drew attention to the dilatation of the blood-vessels in diseased patches and to the changes in their walls; in this case they were not present in the nodules, nor did the diseased areas bear any particular relation to the blood-vessels; hence the theory of a primary basis of disease in the blood-vessels cannot be applied here. In addition to the patches of firm sclerosis which were almost entirely located in the motor tract both in the brain and cord, areas of diffused neuroglia-proliferation were met with in which the medullary sheaths of the nerve-fibres were diminished, the neuroglia-cells enlarged and the protoplasm very granular, especially around the nucleus.

In both hemispheres, in the area surrounding the fissure of Rolando, the cortex was in great part bereft of its cellular elements, most of the ganglion-cells which could be identified as such were reduced in size, nearly all were defective in their staining properties and only a few attained their normal arrangement of nucleus and Nissl bodies. The large pyramidal cells were almost totally absent; there was a large number of small homogeneous masses which were remnants of ganglion-cells. In the spinal cord a descending degeneration in the pyramidal tract on both sides and a generalized diminution in the volume of the whole cord existed. The most prominent change met with in the spinal cord was a sclerosis of the lateral columns limited to that region and extending through the entire length of the columns symmetrically. There was distinct thickening of the neuroglia in the region of a transverse area of the cord occupied by the crossed pyramidal tract. The cells of the anterior horns were for the most part in an unchanged condition, although in the cervical and lumbar enlargements a morbid process in some of the large cells was quite conspicuous; here alteration in and disappearance of the processes, as well as shrinking of the cells into an amorphous-looking mass were observed. An indistinctness in the outline and a breaking up of the cell were occasionally seen. The changes in the nucleus and nucleolus were very interesting; shapeless masses of protoplasm were here sometimes recognized

as the remains of ganglion-cells solely by the presence of a distinct circular nucleus often with nucleolus. The lesion was unquestionably intense in the cervical enlargement (Fig. 3); it gradually diminished in a downward direction; it was also less intense in the upper dorsal region to become more marked in the mid-dorsal region and less pronounced in the lower dorsal cord. In the lumbar region it was quite prominent and then disappeared altogether.

The vascular origin of patches in disseminated sclerosis was suggested by Rindfleisch many years ago; more recently, Ribbert (Virchow's Archiv, Bd. Xc., p. 243, 1882), from a study of the microscopical changes, has arrived at the conclusion that disseminated sclerosis is related to vascular changes. Marie (loc. cit.) draws attention to the vascular changes in disseminated sclerosis, but this is not borne out in all cases. Certainly the cause of the sclerosis in this case cannot be attributed to a lesion in the vascular system, because the blood-vessels were comparatively free from morbid processes sufficient to have caused disturbances of the circulation.

The interesting features in the case are:

1. The distribution of the sclerosis, it being largely limited to the motor tract, which seemed to be a predilection-spot for the sclerosis.

2. An absence of marked changes in the vascular system.

3. A pronounced secondary degeneration amounting to a descending degeneration in the pyramidal track and complete atrophy of the ganglion-cells.

4. The reaction of degeneration and muscular atrophy.

The variety of conditions under which multiple sclerosis occurs suggests predisposing tendencies of one or another kind common to all and acting in addition to the various special causes. Drawing conclusions from the above case and such cases as those reported by Taylor, we must agree with Mendel, Strümpell and others, that it has its origin in a defect in the original development of the central nervous system, or this may at least be considered as a predisposition. When one considers the number of facts suggesting the relations of multiple sclerosis and infectious diseases and the number of cases in which the affection of the nervous system has first shown itself in the

course of the infectious disease or during convalescence therefrom, it is impossible to deny that there exists a relation of cause and effect. The infectious process only joins hands with developmental or inherited tendencies; it may give rise to secondary disorders of cardiac, vascular, digestive and metabolic origin. Poisonous substances are being formed in the body which are constantly eliminated. When this elimination is retarded or arrested an autointoxication takes place, which bears its share in the production of disease. Our knowledge of these tendencies is still far from complete, but this theory, as it is applied to mental and nervous disorders, gives us new hope of finding the primary cause of disease. In the case under discussion we have the predisposing cause in the congenital defects and the primary cause which may have been an infectious disease in early childhood. Although there is no history of this, it is not likely that the patient escaped all the diseases that are common at that age. It is more probable, however, that an autointoxication from defective elimination, of which we have good evidence, may be considered as the primary cause.

FIG. I.

FIG. IV.

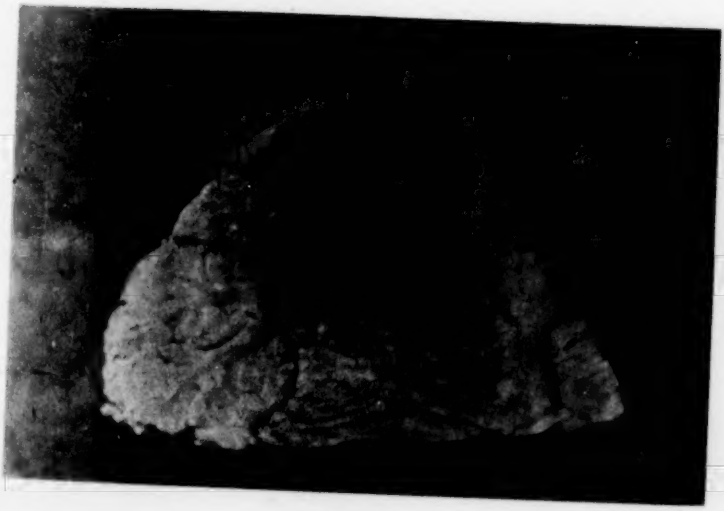


FIG. V.

A TRANSVERSE DORSO-VENTRAL SECTION THROUGH THE MOTOR REGION OF THE RIGHT HALF OF THE BRAIN, SHOWING THE COURSE OF THE PYRAMIDAL TRACT AND THE SCLEROSIS IN THE FRONTAL, LEG, ARMS AND FACE CENTERS FROM BEFORE BACKWARDS.

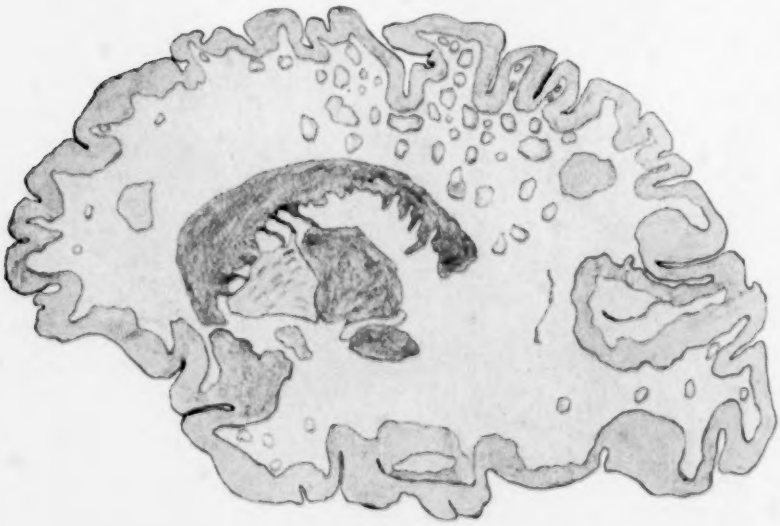


FIG. II.

A SAGITTAL SECTION TAKEN THROUGH THE RIGHT HEMISPHERE, SHOWING THE SCLEROSIS LARGELY LIMITED TO THE MOTOR REGION.

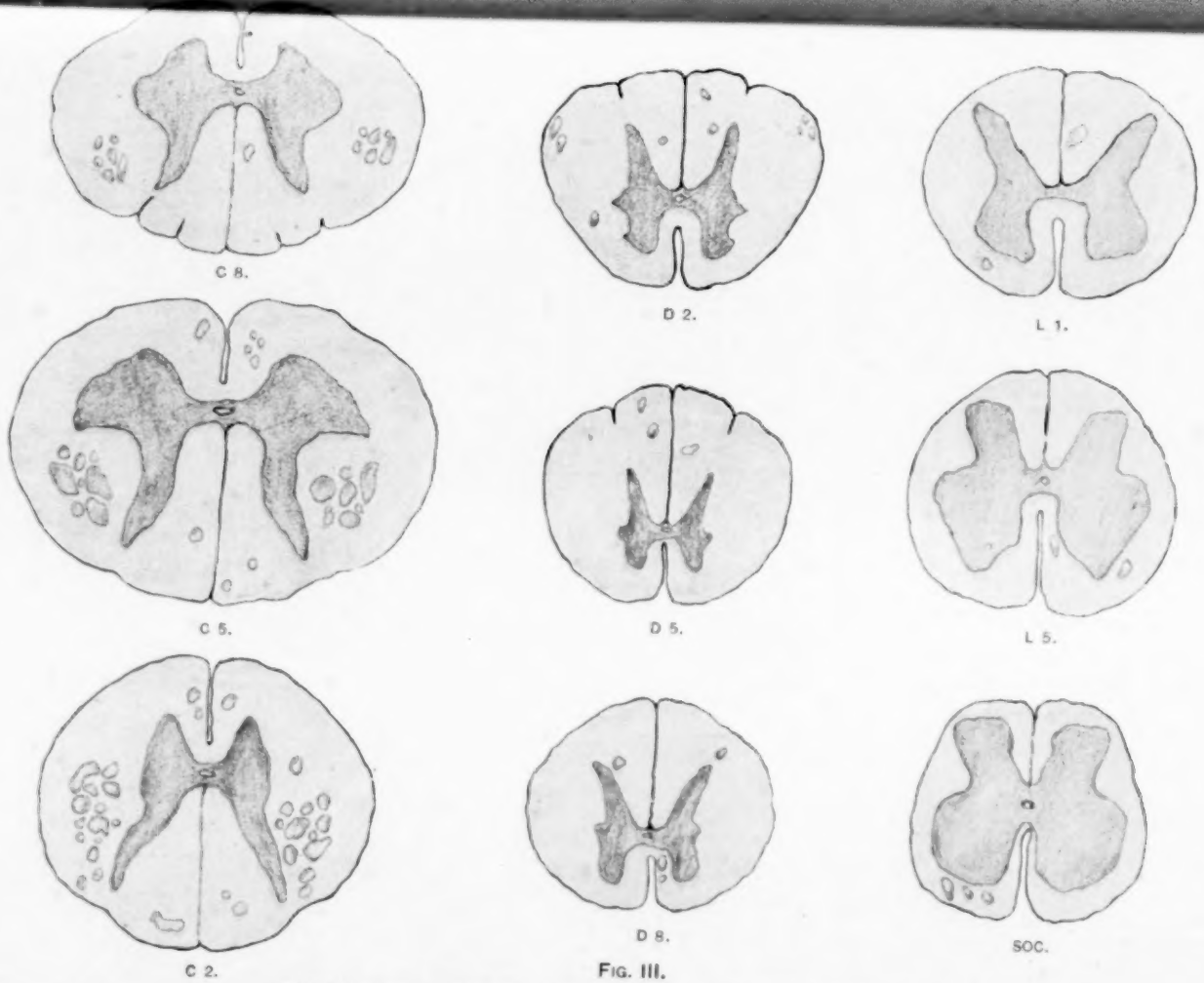


FIG. III.

DIAGRAM SHOWING THE SCLEROSIS OF THE SPINAL CORD AT DIFFERENT LEVELS.

THE COLONY SYSTEM OF CARING FOR THE INSANE.[1]

By HERMAN OSTRANDER, M. D.

The tendency of modern methods is toward the segregation rather than the aggregation of the insane. The large, massive structure where hundreds are herded together for safe-keeping is slowly but surely being supplanted by the villa or cottage where the unfortunate can find a home. People are learning that home-life is the most natural, the most comfortable and the most economical for the insane as well as the sane.

The colony, cottage and boarding-out systems are but different methods all seeking the same result—increased freedom, comfort and improvement for this class of unfortunates. Each system has its special advantages and adaptations to localities and peculiar conditions. Even the old corridor- or block-system possesses some features that are better adapted to certain cases than any other. As Dr. Frederick Peterson has expressed it in a paper touching on this subject: "Doubtless the ideal asylum when it is built, will be one which shall have assimilated what is best in both plans."

The boarding-out system was first established in Belgium some time in the 18th century. The history of the Colony of Gheel you are all familiar with.

Some of the other European countries, notably Scotland, have adopted this system and are using it with a success that is satisfactory to them although it has received much adverse criticism. This system consists in boarding out in private families the quiet, trustworthy incurables. The plan in Scotland was first agitated by Sir Arthur Mitchell over thirty years ago. At present about 23 per cent. of their insane are cared for in this way. The

[1] Read at the Seventh Meeting of the Association of Assistant Physicians of Hospitals for the Insane, at Cleveland, Sept. 26-28, 1899.

methods employed differ from those in Gheel in that the insane are not boarded in one village or commune but are distributed throughout the farming-communities.

This system has been employed in Massachusetts with varying degrees of enthusiasm, but has not yet found general favor in this country. The advantages claimed for it are that it affords the most ready and economical means of providing for the increasing number of insane, more homelike surroundings and increased comfort and contentment for the patient. Experience seems to have demonstrated that patients once established in homes have no desire to return to asylum-life. The objections offered to the plan have so far been made mainly on theoretical grounds and by those who have had no practical knowledge of the system. The most valid objection to my mind is one that should condemn the whole system, namely, that constant association with the insane has a demoralizing effect on the sane, especially the young. It seems to me that the object of removing the insane to hospitals is as much to protect society as to properly care for the patient; that it is even more necessary that society should protect itself against the pernicious influence exerted even by the more comfortable of this class of unfortunates than that everything should be sacrificed for their comfort and welfare, and the fact that people can be found who are willing to subject themselves and their families to such an influence for a monetary consideration, should not figure in the matter.

There is a widespread tendency in the United States to break away from the corridor- or block-plan of constructing buildings and to erect cottages grouped around the main building. In many instances the idea of economy seems to have dominated all other ideas. The cottages are huge houses which but very faintly suggest the idea of a home. Nevertheless, it is a step in the right direction.

The colony-plan is too old to be considered an experiment. It is steadily growing in favor in foreign countries, especially in Germany. In William P. Letchworth's book, "The Insane in Foreign Countries," is an interesting description of the asylum of Alt Scherbitz near Leipsic which was established in 1876 and is conducted entirely on the colony-plan. In a paper read before the American Medico-Psychological Association in May last,

Dr. Peterson, quoting from the sixth edition of Kraepelin, 1899, says: "The construction of asylums has experienced extraordinary progress of late years by the evolution of so-called colonies in which the patients are, as far as possible, given liberty and occupation in country pursuits." "The whole question of the care of the insane for a long time has probably found its solution in this best and relatively cheapest method of support." In June, 1887, the late Dr. George C. Palmer, then superintendent of the Michigan Asylum for the Insane, presented a paper before the association of medical superintendents of American institutions for the insane on the same subject which the writer has chosen for this paper. His views as expressed in his paper were not altogether theoretical, but had some basis in practical experience. In 1886 the trustees of the Michigan Asylum purchased 256 acres of land known as Brook Farm, situated two and one-half miles north of the main buildings, to be used as a dairy-farm. A cottage was constructed for the accommodation of forty-five male patients with their necessary attendants. These patients were to assist in caring for the cows and in the general farm-work. The success of the scheme and the improvement manifested by the patients exceeded the most sanguine expectations. From this as a nucleus, the colony-scheme for that asylum was projected. The plan of Dr. Palmer's contemplated the establishment of a colony for quiet, chronic patients in cottages each with a capacity not to exceed thirty persons, to be located in some farming-community near the main institution by which it was to be managed and from which it was to receive its main supplies. The advantages suggested by such a plan were as follows:

1. It increases the means of classification, meets more fully individual necessities, and restores home-life as nearly as practicable.

2. It affords speedy relief; within a year provision can be made for the reception of patients. To locate, construct and organize an asylum after the plan of those established in most of our States, three or four years are required.

3. It is better adapted to the class of patients for which it is intended, as it grants greater freedom and tends to cultivate habits of self-reliance.

4. It provides suitable occupation for all patients able to work, so organized as to be made most remunerative to the institution. Occupation, judiciously directed, constitutes one of the most important aids to treatment.

5. It affords an important change, which will exert a curative influence over patients.

6. It is the most economical plan of providing for the insane, reducing materially the cost of accommodations, as well as of maintenance, without reducing essential comforts.

Pursuing the plan outlined by Dr. Palmer, the trustees in 1887 and 1888 sought to enlarge the colony already started, but were unable to obtain land adjacent to Brook Farm. They therefore purchased a tract of land about two and one-half miles southwest of the main buildings. This tract consists of 357 acres. Two hundred acres are of tillable farming-land, about forty acres are of oak- and hickory-timber and the balance is pasture-land and lakes. The grove is so situated that it skirts the shores of and overlooks the lakes and forms a beautiful park to which the name "Fair Oaks" has been given. The original idea of the promoter of this scheme was to acquire in one body, if possible, a tract of six hundred or seven hundred acres so as to afford an opportunity for diversified farming—one portion to be used for raising milk, one for fruit, one for garden-vegetables, one for general farm-products, etc. The legislatures, however, have not favored the further acquisition of land, although it has been available in the immediate vicinity. Consequently, the original plans have of necessity been considerably curtailed. On this tract of land which constitutes the colony proper, have been erected three houses for women, one with a capacity for thirty-five, one for seventy-five, and one for eighty-one patients; one cottage for men with a capacity for seventy-two, and a physician's residence. The cottages are all built on the dormitory-plan, are supplied with separate steam-heating apparatus, are lighted by electricity transmitted from the power-house at the main asylum, have sewer-connections, and, with the exception of laundry-appliances, are completely equipped for housekeeping. The cottages for women and the physician's residence are situated in the grove overlooking one of the lakes. The cottage for men is about one-half mile distant from these. The colony has its own system of water-

works. The water is elevated to a tank by means of a pump which is operated by electricity transmitted from the main asylum. The sewage is disposed of by the intermittent sub-surface system. Drives have been laid out about the parks. The lakes are small, deep and fed by springs, they are kept well stocked with fish and the water in them is pure and suitable for all domestic purposes. Large yawl-boats, each capable of carrying twelve or fifteen persons, have been provided, and boating and fishing are among the pleasures indulged in by the patients. The farm is adapted to the raising of stock, poultry, garden-vegetables, general farm-produce, fruit and celery. The milk consumed at the colony and a portion of that consumed at the main buildings is supplied from here. The open-door system prevails at two of the cottages, and a large number of the patients at the other houses enjoy the liberty of the grounds.

The success of the colony has been considerably hampered by reason of its isolated location and its inaccessibility. The transportation of supplies and of patients and employes has to be made in wagons and carriages over a rather poor country-road, the distance by this road being three and one-half miles to the main buildings and five miles to the city. This difficulty, fortunately, is likely sooner or later to be removed by the building of an electric railroad direct from the colony to the main buildings to be owned and operated by the asylum. Already the right-of-way has been obtained, and the road will be constructed as soon as the necessary funds are available.

The colony has been in operation thirteen years. It is my purpose to discuss in this paper the advantages claimed for it by its promoters, the further advantages suggested and the disadvantages demonstrated by its development. To my mind it is to be regretted that the originator of this system saw fit to deviate from the original idea of erecting small cottages for from twenty to thirty patients each. It was done in the interest of economy but at the expense and comfort of the patient. At present the idea of a cottage exists only in the name. The cottage where the most homelike atmosphere prevails and where the patients have always been the most comfortable and contented is the smallest of the group. The experience of thirteen years has demonstrated beyond question that the colony-system

can accomplish all that Dr. Palmer claimed for it in the six propositions setting forth its advantages.

The first proposition needs no argument or elaboration. That the housing of patients in small cottages instead of large buildings, affords advantages in classification, that it tends to develop the individual as a whole by making him a part of a complete household, and that it makes his surroundings more homelike, none will doubt.

The second proposition is equally self-evident. It requires but a short time to construct cottages and the overflow of the main asylum is readily and easily provided for, while by the old method, the asylum was, at times, overcrowded to the point of discomfort and almost intolerance, awaiting the tedious process of securing large appropriations and of building large structures which often required several years for construction.

Concerning the third proposition, it may be said that the removal from the bustle and confusion of institutional life, the absence of institutional features, the complete isolation from the asylum-world, so to speak, have permitted almost unlimited freedom. In some few cases the confidence reposed has been betrayed, but in the majority of cases it has been appreciated and habits of self-reliance and self-control have developed.

It is in the fulfillment of the fourth proposition that the colony-plan shows to best advantage. It seems to me that no one feature of the care of the insane receives so little attention as the occupation furnished them. Attendants are too apt to consider but one side of the question and that is, how to get the work done. Assistant physicians too often either give the subject no attention at all or rely on the judgment of the attendants to furnish suitable occupation for the patients. The prime object in the employment of the insane is to apply a therapeutic measure which will hasten recovery or improve the mental condition, and it seems to me that it ought to be prescribed as carefully as the medicine or the diet of a patient.

Ideal occupation for patients is difficult to supply in large institutions. The aggregation of a large number of persons in one building tends to the specialization of labor, and this is not conducive to the complete development of the individual. The work is such that it is done automatically and furnishes no incen-

tive or mental stimulus. The colony-system provides each individual with a great diversity of occupation and the character of the work is such that it tends to stimulate and to bring into healthy action every mental faculty. The intelligence with which many of our colony-patients assume and perform responsible duties, is extremely interesting and gratifying.

I have a vivid and pleasant recollection of a male patient who was received at the colony somewhat depressed and confused in mind. He had been employed in the main building in wiping dishes. On consulting his clinical record I found that he had been a carpenter by occupation. There was an abundance of work at his trade available at the colony and he was placed in charge of it. He repaired all the broken furniture and did all the necessary carpenter-work about the establishment. He supervised a party of patients in the work of tearing down an old abandoned horse-barn, saved the lumber, moved part of the framework to the lake and converted it into an attractive boat-house. He converted the balance of the building into a carpenter-shop. He seemed able to repair any piece of machinery about the premises. He put a center-board in one of the boats and made a sailing-vessel of it and was seriously considering the feasibility of converting one of the yawls into a steam-yacht by utilizing an unused steam-boiler, when he was discharged as able to take care of himself. His rapid improvement dated from the time he was given suitable employment.

It has been my practice in assigning work to consult the wishes of the patient as far as practicable, and to assign to each such duties as he is best adapted to perform. The patients are made to feel and assume a certain amount of responsibility. Those who possess sufficient intelligence and executive ability are appointed to direct the work of those who are less active mentally. To illustrate: of the nine horses kept for the use of the colony, not one is regularly driven by an employe. Each patient-teamster has from one to three or four other patients to assist him, the number depending upon the kind of work he is doing. He receives his instructions from the supervisor just as any employe would. One patient with an assistant delivers ice, wood, vegetables, etc., to the various cottages, another has sole charge of the fowls, five or six hundred in number, and

has made this one of the most profitable departments at the colony. A patient delivers all of the supplies from the main building. This is considered a very responsible position. The supplies are collected from various departments on requisitions and delivered to the different cottages. (Until within the past few months this position had been filled by a paid employe at thirty dollars per month and board.) And so I might enumerate many departments of work that are looked after by patients with little or no supervision. Of a population of 674 male patients at the Michigan Asylum, there are at least 197 who can be trusted in open-door cottages and who are capable of performing some work. This estimate was made for me by the general supervisor and can be considered a very conservative one. I have no doubt that by judicious experimentation, the number could be increased. Of this number thirty-three are capable of directing the labor of others, of planning work, of working by themselves without any supervision, of keeping records; in fact, of doing any kind of work that is required of the attendants who have charge of them. One hundred and one can work well and intelligently under directions. Sixty-three can do some work but they require closer supervision. These facts furnish a suggestion which I hope this Association will think worthy of discussion, viz., that twenty-five to thirty per cent. of our entire male population is capable, under the direction of a physician and a general supervisor, of conducting a colony and caring for it with no other supervision whatever. Among the more capable ones are one or two carpenters, a blacksmith, a mason, a plasterer, teamsters, farmers, gardeners, and those accustomed to the care of cattle, swine and poultry. Each has had much experience and still possesses considerable skill in his special line of occupation. It seems to me that this suggestion is worthy of serious consideration.

The fifth proposition states that this system affords an important change which will exert a curative influence over patients. This has been demonstrated in those cases that have been sent to the colony to complete their period of convalescence. The change is especially beneficial to cases of retarded convalescence.

I have never been so impressed with the good effects produced

by a simple change in surroundings as during the past summer. An unused house which had been built for an employe was converted into a camp, so to speak, and was fitted up with furniture, straw-beds, an old cook-stove and primitive implements adapted to crude housekeeping. The bread-board was a window-glass and the rolling-pin a two-quart glass fruit-can. To this cottage, every week, were transferred four or five patients from the main building, with a nurse in charge, to camp out. A hen-roost and a vegetable-garden with a melon-patch were within convenient distance. The instructions given them were to forage or beg their living, and to have a good time. The only complaint that I heard was that the outing-season was too short. The improvement in some of these patients was marked and promises to be permanent.

The sixth proposition is that the colony plan is the most economical for providing for the insane—reducing materially the cost of accommodations as well as maintenance without reducing essential comforts. It is estimated that to have erected suitable buildings for the accommodation of 2700 patients boarded out in Scotland would have cost $10,000,000, or over $1800 per patient. At the colony at Alt Scherbitz, cottages for the accommodation of twenty-five patients each are constructed at a cost of $4500 or $180 per patient. These two estimates probably illustrate two extremes in construction expenses. In Michigan there is a difference in construction expenses of about $400 per patient in favor of the cottage-system. Much of this economy is due to the fact that the cottages are built on the dormitory-plan. This plan seems to be generally accepted as a suitable one to provide sleeping-accommodations. Personally I am opposed to it. There is nothing but its cheapness to commend it and there is much to condemn it. It is a sufficient condemnation that it is complained of by nearly every patient of any intelligence who has been made a victim of it. It is dangerous and unhygienic, a promoter of discontent and an enemy to refinement. If any class of people need restful sleep, it is the insane. If any one thinks this can be secured in dormitories occupied by ten to thirty patients, let him try it. I never make a round without finding one or more patients dosing in chairs or on settees trying to make up for loss of sleep. I hear more complaints from this one source than

from all other causes combined. The majority of altercations occur at night and between patients occupying the same room. The dormitory-system tends to overcrowding. One rarely sees a dormitory in an asylum which is not crowded beyond its capacity. Some of them have double the number of beds which the rooms were originally intended to accommodate. Again, it is impossible with this system to cultivate or even keep intact the refinements to which the most ordinary human beings have been accustomed.

There is considerable economy in the maintenance of patients at the colony. The food is served in greater variety, is more satisfactory and costs less per capita than the average cost per capita for the whole institution. The patients at the colony require less supervision. At the main building the proportion of attendants to patients is about one to eight; at the colony it is one to sixteen. It has been argued that the removal of the comfortable class from the main buildings would necessitate an increase of the force of attendants in the wards and thus there would be no real economy in the plan. This has not proven the case with us.

Experience has demonstrated that the more disturbed and less comfortable patients can be instructed to do the routine-work in the halls. Again, there is economy in the fact that the bulk of the labor performed at the colony is remunerative to the asylum. There is a ready market in the institution for everything that is raised on the farm.

The ideas suggested to me by watching the development of the colony-system are that its utility is not limited to the class of patients mentioned by Dr. Palmer. There is no reason why the more disturbed and refractory should not be housed as comfortably in cottages with locked doors as in large buildings. Of this class in the Michigan Asylum there are at the male department 56 who are able-bodied workers, 94 who are capable of doing some work and 93 who have to be constantly cared for and who do nothing. There is no kind of employment so well adapted to this class of patients as farm-work, and I believe that many of them would become more comfortable and tractable by a change to the colony and would eventually be able to be transferred to the quiet class; indeed, some of our most disturbed patients have developed into trustworthy farm-workers who are able to live in an open-door cottage.

It seems to me also that the colony-system affords a rational plan for the treatment of able-bodied insane epileptics. Cottages could be erected with especial reference to their care and treatment. Their removal from the wards would relieve the other patients from a great source of distress; they could be better classified, and the colony-plan affords the best facilities for the dietary, hygienic and disciplinary treatment which is so essential to their comfort and improvement. Many of them are the best workers we have in the asylum.

I have not had time to collate any statistics in reference to the women, but it is quite possible that as many of the women as men are adapted to life in a colony. There is not so great a diversity of occupation for women as for men. The female patients at our colony are employed in housekeeping, making their own clothes, cultivating flowers and, in the proper season, picking fruit and gathering garden-vegetables. With proper facilities they could do all of the laundry-work for the entire colony.

The chief disadvantage of the system which our experience has revealed has already been mentioned. We have been put to considerable inconvenience in transferring provisions, fuel, patients and nurses in wagons over poor roads and in all kinds of weather. The construction and equipping of an electric road, which is entirely feasible, would remove this objection and practically bring the two departments together. However, the theory of the originators of the plan that it is desirable to have the colony at a distance of from three to five miles from the main building to insure complete absence of institutional features, does not find favor with the present superintendent and board of control. In his biennial report of the institution for 1895-96, Dr. Edwards makes the following comment bearing on this point: "Experience has convinced us that an institution that can obtain a sufficient amount of land in one tract to sustain the required number of cows to provide its milk-supply and to furnish garden- and farm-lands to employ its patients will make a serious mistake in buying farms not contiguous to land on which its principal buildings are located. If sufficient land, an acre or at least two-thirds of an acre for each patient, cannot be obtained, it would be justifiable and advisable to purchase a detached farm, but an error will be made in attempting to colonize patients on more than one farm."

Many institutions are so located that a colony in connection with them would be impracticable. Either land near them is not available or is available at so high a price that the economical features of the plan would be destroyed. I see no reason, however, why one colony should not receive patients from three or four institutions if sufficiently near one of them so that transfers could be made conveniently in cases of emergency.

The objection that patients are deprived of the privileges of attending concerts and chapel services at the main asylum is scarcely worth considering. There is no reason why sufficient diversion of this sort should not be furnished at the colony. You might as well condole with those at the main building that they are deprived of the pleasures of picnics, boating, fishing, etc., available to the colonists. In some editorial comments on this subject published in Vol. 43 of the AMERICAN JOURNAL OF INSANITY unfavorable mention is made of the social banishment of the solitary member of the medical staff, of the small amount of strictly professional work he has to do and the occupation of his time and his mind with petty details of administration. As a resident physician of the Michigan Asylum Colony during the past six years, I may, perhaps, speak as intelligently on this point as any one, and I have this to say: That I have no more administrative work to do than any of my associates. I have time and opportunity to see, examine and watch the progress of every case that is admitted to the asylum, or to work in the laboratories if I see fit to employ them in that way. I have more uninterrupted time to devote to study or scientific research than any other member of the staff. If I fail to keep abreast of the times, it is not the fault of my location at the colony.

In closing my paper, I desire to say that my experience with the colony-system, and my study of its possibilities, warrant me in offering the following conclusions:

That it offers an economical and ready method of extending the old and constructing new asylums.

That its cottage-features offer a home for all who can appreciate it, which is about fifty to sixty per cent. of the entire asylum-population.

That its industrial features offer occupations that are healthful to the body, stimulating to the mind, and so remunerative as to materially reduce the expense of maintenance.

That it is adapted to the disturbed as well as to the quiet cases.

That it offers a rational plan for the treatment of the able-bodied epileptic insane.

That the feasibility of the plan of self-government of twenty-five or thirty per cent. of the asylum-population, offers sufficient promise to warrant its trial.

That the capacity of each cottage should be limited to twenty patients. Any excess of this number tends to destroy the home-feeling and breed discontent.

That the dormitory-plan of constructing cottages is pernicious and should be abandoned.

That it is preferable to have the entire institution on one tract of land which should consist of not less than one acre to each patient.

That it is impracticable to operate a colony located at a greater distance than three miles from the parent-institution.

GENERAL PATHOLOGY OF MENTAL DISEASES.[1]

By HENRY J. BERKLEY, M. D.,
Clinical Professor of Psychiatry, The Johns Hopkins University.

The pathology of mental disorders may be roughly divided into two parts, the one belonging to the so-called functional disorders from which recovery is not unusual, the other that of the organic-degenerative types, in which an eventual restoration

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Page 474, first line, read *nucleolus* instead of nucleus.

Page 474, twenty-sixth line, read *nucleolus* in place of nucleus.

present in physical disease, and one might expect that these clinical pictures would correspond with certain definite changes in the cerebral nerve cell. Such, however, is not the case, except in rare instances. Our main difficulty in this connection lies in the fact that the nerve cell has but few ways of showing in its structures the presence of deteriorative processes, and even such changes as are recognizable may, for reasons with which we are entirely unacquainted, in different cases, give rise during life to quite inconstant and contradictory clinical symptoms. Take, for example, so coarse a lesion as a tumor pressing upon the cortex; in one individual its presence may produce a condition of deep depression, while in another it is associated with states of excitement, and yet in each case the tumor may have a precisely similar situation and size.

[1] From advance sheets of "A Treatise on Mental Diseases, Based upon the Lecture Course at the Johns Hopkins University, 1899. By Henry J. Berkley, M. D. D. Appleton & Co." (In press.)

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The pathology of mental disorders may be roughly divided into two parts, the one belonging to the so-called functional disorders from which recovery is not unusual, the other that of the organic-degenerative types, in which an eventual restoration to mental health cannot be expected. The boundary line between the two forms is not always sharply drawn, inasmuch as cases which apparently begin as a primary form of insanity may, by repetition or continuance, pass over into the second classification.

Even among the organic-degenerative types, an absolute pathology, such as is found, for example, in pneumonia, in which definite clinical symptoms accompany certain pathological states existing in the lung, is very rare. It is true that in mental disorders we ofttimes have quite as precise symptoms as those present in physical disease, and one might expect that these clinical pictures would correspond with certain definite changes in the cerebral nerve cell. Such, however, is not the case, except in rare instances. Our main difficulty in this connection lies in the fact that the nerve cell has but few ways of showing in its structures the presence of deteriorative processes, and even such changes as are recognizable may, for reasons with which we are entirely unacquainted, in different cases, give rise during life to quite inconstant and contradictory clinical symptoms. Take, for example, so coarse a lesion as a tumor pressing upon the cortex; in one individual its presence may produce a condition of deep depression, while in another it is associated with states of excitement, and yet in each case the tumor may have a precisely similar situation and size.

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Of the cell-lesions in simple insanities (mania, etc.) we have but the most vague ideas, beyond that during life we are able to note temporary congestions, vascular hyperaemias, and conditions suggestive of oedema cerebri, or the reverse, arterial spasm. With the hyperaemias and oedemas we know that there can be disturbances of the important outward flow of the lymph from the intrinsic cerebral tissues, and retention of products of tissue waste which can seriously interfere with the proper working of the nerve cell. Of their etiology we have no accurate conception, although we have good grounds for assuming that storage of toxic products from the alimentary canal and disordered products of the secretory glands or the converse, diminution of the secretions, perhaps also defective elimination of urates and the ammonium series by the excretory organs may periodically take place in the animal economy, and cause the disturbance.

But again, as is well known, these latter conditions are present in certain other affections in which there is ordinarily no evidence of grave mental disturbance (gout, etc.); while the hyperaemias and oedemas are often seen in the essential fevers without any disturbed mentalization on the order of an insanity. We are then obliged to assume, and the conclusion is one that admits of little dispute, that there is a predisposing element, pre-existing *ab ovo*, or acquired through toxaemias or habits of life, that lessens the resistance of the psychical cells, and renders them liable to ready disturbance of their normal functions. This tendency, although it may sometimes be acquired, is much more frequently born with the individual, so that in the majority of the mentally afflicted we find a directly inherited predisposition to insanity. In the clinic this is only too clearly apparent in the hundreds of individuals standing just above the limit line of the imbecile, who, as the result of some unusual strain, overwork, bad or insufficient food, over-sexual excitement, or a febrile disease, fall by the wayside and become insane.

A very fair illustration of the instability of the nerve tissue of one individual in comparison with that of others, is seen in some children, who, under febrile conditions, become delirious at a bodily temperature at which others, possessing more stable nerve matter, will show no signs of mental disturbance. Again, pain in certain temperaments will occasion disorder of the brain functions. At the present time I have under my charge a lady, who,

whenever she has a severe attack of colic, will exhibit the most vivid hallucinations and become highly excited. Under the quieting influence of anodynes this excitement quickly passes, and the patient returns to her normal condition until the next attack. It is hardly necessary to mention that in her case, there is a strong family history of insanity.

Heredity, therefore, is by far the most important factor with which we have to deal in the consideration of the pathology of the main types of insanity. Its influence may be recognized in divergencies from the normal in the structure of the brain convolutions, or in the very numerous abnormalities that may be noted as every-day occurrences in the cerebral vessels of those dying insane. Hereditary defects show themselves also in the form of premature senescence, a striking example of which may be noticed in the extremely early arteriosclerosis, even between the twelfth and twentieth years of life, that is so frequently to be observed in the imbecile class. Other beginning lesions in the brain tissues may certainly be assumed when we find so coarsely ordinated structures as those of the vessels degenerating at this early age; indeed examples of retrogression of the mental functions at the age of puberty or thereabouts are of not infrequent occurrence in practice, the victims being usually the children of intemperate or hereditarily burdened parents.

In the grosser forms of degeneracy, in the idiot and the imbecile, deviations from the normal in the development of the brain, the convolutions, cells, or association fibre-bands, defects in the architecture of the tissues or of the bony envelope, in a word, malformations of the most diverse kinds, show the retrogressive type of brain, and account fully for the deviation from the physiological mental functions. Microscopically, divergencies from the normal in the principal types of cell are fairly readily demonstrable, the embryonal form being retained, while, as Hammarberg has shown by careful count, the idiot brain does not contain the same number of nerve units as that of the better developed person. Even the coarse Golgi method shows abnormalities in the form and component parts of the cell, the feeble protoplasmic extensions showing an infinitely smaller number of the gemmules than the dendrites of the highly developed normal psychical cell, while many of those present are malformed.

But despite the fact that many points in a consideration of the pathological substratum of insanity are still obscure, there are sign-posts that point out the lanes and byways by which one may reach something approaching a high-road to the goal. For example, in the various dementias, notably in the one so-called paralytic form, in the states of exaltation and depression from gross lesion of the cerebrum, and in toxic insanities, a fair conception of some of the processes inducing mental disease is to be ascertained.

Foremost among the actual lesions of the cerebral tissues that predispose to degenerative insanities are those of the vascular structures, that we ordinarily class as periarterial, endarterial and atheromatous changes, but which comprise a vast number of separate and distinct vascular lesions, which will be treated of more in detail toward the end of this chapter. These various lesions may be found in persons showing the most diverse mental disturbances, but all, with the exception of fibrosis, occur in the post-adolescent age.

Such degenerative changes affecting the walls of the vascular channels react upon the brain tissues in two ways, and in either case may be of vital importance to the cell. In the first place, the supply of nutrient plasma may be shut off to such a degree that the cell suffers from hunger, and, as in the last moments in the life of all tissues, a struggle to obtain nutriment ensues. This is shown clinically as a stage of excitement, after which the animal dies or becomes demented. Equally sure in its eventual results, but of slower progress toward dissolution, are the effects resulting from a damming back of the return flow of the used nutrient plasma, a lesion upon which too much stress can hardly be laid, as it is found in the majority of chronic insane cases which come to the autopsy table. Here we have to deal not only with a retardation of the return lymph flow but also with the effect upon the delicate nerve cell of the waste-tissue products that are evolved in the process of constructive metabolism.

One of the most frequent causes of the retardation of the return flow lies in proliferative diseases of the adventitia with the accompanying heaping up of round nuclei within the lumen of the perivascular space, until they partly, or completely fill it. Occasionally, in acute infectious diseases, the obstruction is

caused by aggregations of white blood cells which have transuded into the space, where they disintegrate, the detritus mingling with that from the adjacent nerve tissues thrown into the lumen by the action of the vascular gliacytes. In experimental toxaemias this degeneration, and subsequent disintegration of the lymphoid cellular elements play an important part in the general disturbance, and undoubtedly help to more rapidly disorganize the nerve unit. Not alone in the brain tissue is the lymph flow retarded, but in the vascular pia the channels are more or less obstructed by detritus, and disintegrating elements of an epithelial and endothelial nature.

In many chronic diseases of the brain, the disturbance of the lymph flow by the presence of degenerated and proliferated elements, with accumulations of hematoidin, both crystalline and amorphous, is the striking histological feature in sections from the pia and from the cortex cerebri. These changes are much more definite and comprehensible than the vague alterations seen in the nerve cell, which only mark the presence of an atrophic process, and which in most instances have resulted from the preceding vascular alterations.

In some of the acute mental troubles (delirium grave, febrile and confusional insanities), the chemical and bacteriological examinations of the blood and excretions have shown the presence of bacilli, and poisonous substances (the products of the organisms or the consequences of defective elimination or of intestinal putrefactions), which have been absorbed into the system and, circulating through the blood, have induced alterations in the cell sufficient to disturb its vital properties, shown clinically in excitement followed by some phase of stupor. In these cases we possibly have to deal with a rapid degeneration of the elements of the vascular wall, accompanied by cell-fragmentation and necrosis, death or recovery following according as the infection is mild or severe.

Let us consider a moment the probable effects of vascular lesions that induce a partial stoppage of the nutrient supply to the psychical nerve cell and its supporting tissues.

Monti, among others, has shown that as a consequence of the artificial induction of minute embolisms of the cerebral arteries, the nerve cells practically die within a period of from three to

twelve hours after the blood supply has been shut off. It is no less true that with an inadequate supply of nourishment an equally certain, though slower, progress toward cell-death must be induced. The nerve body gradually loses its activity, changes beginning in the more distal portion of the cell proceed toward the center until finally the nucleus becomes implicated.

It is exactly this lack of a sufficient nutrient supply that gives a distinctive pathology to the frequent types of dementia that begin after the middle period of life. Furthermore, I fully believe that in these slowly progressive vascular changes we shall finally determine, from a pathological standpoint, the origin of the majority of the various types of the organic-degenerative forms of mental aberration, the first alterations in the vessels inducing the gradual change from full mental powers to the slight mental obliquities, irritability without cause, forgetfulness, perverted impulses and similar minor signs that stamp the beginning of the first stage. Later, when the lesions in the vessel-walls have progressed, the nutrient plasma, transuding through them, being altered both in quantity and qualtity, we find a rebellion of the brain cell to the lack of its accustomed food, showing itself in a stage of acute excitement; and lastly, when the nutrient supply has sunk to a point barely sufficient to maintain the cell alive, and chemical and histological alterations have been induced in its protoplasm, there results the final stage of terminal dementia.

Objections to this scheme may be made on the ground that all dements do not show signs of pronounced vascular lesion, which is true, the theory being strictly limited to cases occurring in the retrogressive period of life, the others being accounted for by the original defective construction of the neurone. Toxic conditions, gastro-intestinal or otherwise, may play an important part in the dementias of earlier life which occur mainly in hereditarily-burdened persons. We know that in these individuals moderate doses of alcohol are fraught with disastrous consequences, showing that even minute quantities of a poison act as an irritant, and, circulating with the blood, are capable of inducing permanent lesions of the nerve cell, lesions too fine to be discovered by our microscopes, and probably in the nature of a chemical change in the molecular substance. Again, changes in the sheaths of the vessels are probably induced at any period of

life by the infectious diseases, some of which may cause a permanent disability of the tissue.

The hyaline degeneration of the vascular walls so often found in the insane may be reproduced experimentally in animals by repeated inoculations with cultures of staphylococcus pyogenes aureus (Davidsohn), so that one may readily understand how in a human subject, in whom there exists an ever present instability of neural tissue, changes both rapid and pronounced may follow an infectious disease. After typhoid fever, after pneumonia, and a host of other maladies due to the action of pathogenic organisms upon the general system, there occur forms of mental disease, pronounced and characteristic in type; and while many of the pathognomonic lesions have vanished in the months or years of life succeeding the illness, enough remain at the time of autopsy to satisfy us that the original process of all was a lesion of the vessel-walls antecedent to or concomitant with that of the psychical affection. In those already insane, we often see that with a comparatively slight infectious process affecting primarily the chest or abdomen, the stress of the disease is transferred to the brain, so that the chronic maniac or dement becomes actively excited, or falls into an unconscious state, with frequent attacks of an epileptiform nature. Seitz has applied the definition "toxaemia cerebro-spinalis" to a similar group of cases, a term that it would be advisable to extend into general use.

While the insanities from intestinal infection or from the waste-tissue products, stored up in the body owing to imperfect action of the renal apparatus, are probably the most frequent of the toxic insanities, there are undoubtedly others that have their origin directly in the poisons generated by streptococci, staphylococci, bacillus coli communis and bacillus lanceolatus, the last organism having been isolated from the meninges more frequently than any other. Even at the present day our knowledge of the infectious processes in the meninges and brain substance is often sufficiently accurate to allow of a diagnosis of insanity as the result of the effect of bacterial toxins upon the cerebral pulp, and it seems probable that further research on these lines will lead us to look upon not a few of the mental diseases as only a part and parcel of the reaction of the general

organism to these poisons, and to treat them, accordingly, with a larger hope for success than when we regarded mental symptoms solely as the outcome of a diseased brain, an organ which in every-day acceptance has nothing in common with the remaining portions of the body.

GROSS PATHOLOGICAL ANATOMY.

An examination of the outer envelopes of the brain often yields information of very considerable importance; indeed it is quite possible, when certain lesions of the meninges are ascertainable, to foretell accurately the condition of some of the most important portions of the nervous tissues.

The Cranial Bones. These structures may present a variety of conditions of morbid import. The bones may be uniformly thickened to an excessive degree, or may present numerous local thickenings and irregularities. The converse may also hold, the bony plates being sometimes thinned so that their cross section does not exceed that of a sheet of paper. Undue density, from absence of the diplöe, is a rather frequent finding. Unusual friability is found in some cases of degenerative insanities from changes common to all the tissues of the body. The cancellated tissue may be free from blood in anaemic conditions, or suffused in inflammations or congestions of the deeper structures. Thickening of the skull cap with adherence to the dura is frequently found in cases of chronic insanity and in the epilepsies.

On the whole, lesions of the cranial bones are of little moment, beyond marking the fact that alterations in other structures are to be found in insanity besides those in the cerebral substance.

The Dura Mater. The dura may be the seat of varied lesions. Moderate thickening of the membrane with strong adherence to the bone is of great frequency. Inflammatory exudates, hemorrhages from dural and pial vessels cover it, and form cysts and discolorations. Adhesions between the dura and pia are found, but are somewhat rare; they denote a local or general inflammation of the serous surfaces of the meninges. Plaques of ossification are now and then seen, but have little significance, as they usually do not interfere with the outflow of venous blood. A lesion narrowing or obliterating any of the numerous exits through the dura for the venous or the lymphatic circulation, is

of the utmost importance to the nutrition of the cerebral tissues; hence the very striking effect upon mentalization of dural tumors so situated as to interfere with this circulation.

Pia Mater. Far more important than the lesions above recorded, from their clinical significance—for it should be remembered that into the pial meshes flow the return blood and lymph from the cerebral substance—are the various forms of milky-gelatinous thickening of this membrane. A milky cloudiness of the pia is found in the meninges of nearly all persons that come to the section-table after middle age, and with increasing years there is increasing opacity. The degree is, however, insignificant, and the process is not necessarily connected with the lesions found in so many of the chronic insane (50 per cent., Lewis).

The gelatinous thickening of the pia is characteristic of a single lesion, namely, disturbance of the vascular lymph system, a damming back and congestion of the lymph flow, leading to atrophy of the cerebral tissue. The thickening of the membrane is always most apparent over the vertex, particularly in the immediate neighborhood of the Pacchionian (lymphatic) granulations, although the greater depth of the membrane immediately over the fissures may make its apparent density in these latter localities more striking to the eye. When the membrane is closely examined, one sees a large number of dilated veins, intermingled with arteries, together forming meshworks, while along the edges of each vessel of considerable size lies a fine grayish line—the lymph space—dilated and filled with leucocytic and endothelial debris. These white lines form the distinctive lesion of this form of meningeal thickening, which is non-inflammatory, and strictly degenerative.

In examples that show but little thickening, the first appearance of the milky deposit is along the course of the largest pial veins. Later, the exudates from the engorged lymph vessels become diffuse and more and more prominent, until, in the course of time, they give the widespread turbid appearance to the whole central region of the brain, somewhat rarely extending to the anterior and posterior poles. Through the channels of the pia, arranged for the flow of lymph currents and now more or less obstructed with debris, the fluids percolating from the interior structures, are retarded and dispersed, subjecting the delicate

nervous organs to a bath of effete tissue products, some of which, the altered albumins, must be exceedingly poisonous, so that finally there results atrophy and disorganization of the neuroglia and nerve cells. Adhesions between the cortex and pia are infrequent in the large percentage of instances of non-inflammatory thickening of the membrane. Hemorrhages into the pia are common at all ages, and leave traces behind in the form of brownish discolorations and hemorrhagic cysts, which are mainly located upon the vertex, the site of the most active mental processes, where damage to the tissues is of most importance to the life of man as an intellectual being.

Adhesions between the pia and cortex are infrequent in the common gelatinous thickening of the membrane. On the other hand, whenever we find indisputable evidence of pre-existing inflammation of the membranes, such as is ofttimes present in chronic mania, dementia paralytica, and sometimes in alcoholic insanity, we may expect such strong adhesions between the membranes and the subjacent brain substance, that when an attempt is made to remove the pia, it strips off, bringing with it shreds of the brain substance. This so-called condition of *meningo-cerebritis* has, to the naked eye, little in common with an ordinary inflammatory process, but rather represents a pronounced degree of gelatinous thickening. The membrane is vascular, the veins are large, tortuous and dilated, apparently paralytic; their margins are overlapped by broad lines of grayish-white infiltration which spread throughout the surrounding membrane-meshwork, while the trabeculae extending into the brain substance, in contrast to those in the gelatinous thickening from simple atrophic conditions, are now hypertrophied, and cannot be torn away without bringing with them bits of cortical substance. Partly organized lymph with numerous minute, newly-formed vessels, cover the vascular pia, chiefly in the furrows and over the central portion of the brain convexity, being mainly confined to the distribution of the middle cerebral artery. Purulent infiltration, following the destruction of the feebly organized false membranes upon the visceral pial surface, is rarely found, and when present is due to a secondary infection.

On microscopic examination the meshes of the pia are seen to be oedematous and filled with proliferating round nuclei, thickly

aggregated upon the sheaths of the vessels. Much debris of destroyed cells is also seen in the pial meshes, the particles having a tendency to blacken with osmic acid, which is evidence of their fatty nature. The connective-tissue framework also undergoes morbid alteration, becoming thickened, fibrillated, or even hyaline in appearance. The middle coat of the arteries almost always shows evidence of the hyaline or colloid degeneration. Both changes extend into the brain substance. Brownish discolorations from transuded red blood cells are also seen over localized areas of the membrane.

Ruptures of the tortuous and distended arteries succeeded by extensive hemorrhages are only moderately frequent in these various abnormal conditions of the pial membrane, but when they do occur, they are usually followed within a few days by dissolution. The exudates with diapedesis of red and white corpuscles, on the other hand, are found with great frequency in all forms of rapidly advancing cortical disease.

The macroscopic appearances of the substance of the brain are rarely characteristic of any single form of mental disease. In the chronic insanities atrophy of the entire cortex, shown by the increase of straw-colored serum and non-inflammatory thickenings of the pia, is almost universal. Localized atrophies follow thrombosis of nutrient vessels, or partial occlusion of a main artery near its origin in the circle of Willis. Reduction of the calibre of a vessel to that of a hair from arteriosclerosis or syphilitic disease may also result in the localized atrophy of the area supplied by the artery. Vascular dilatations, engorgement of arteries and veins with varicose twistings are frequent, marking the frequent occurrence of hyperaemia of the brain so often noticed as a clinical symptom. The opposite condition, an anaemic state of the cortex is perhaps more frequent than the vascular engorgement, and results from the morbid thickening of the vessel sheaths.

Localized cerebritis, except as the result of thrombosis, tubercular or cancerous growths, within the brain structures, is of extreme infrequency, and, when present, points to a septic or traumatic inflammation. The tissues involved are occasionally rosy red, but may be even paler than the adjacent healthy substance; only with the microscope is it possible to demonstrate

degenerating cells, varicose medullary fibres, and debris of lymphoid cells, with the presence of numerous leucocytes.

Atrophy of the Hemispheres. As a sequel to all forms of prolonged chronic insanity, in paretic dementia, especially when of long standing, after the senile psychoses and dementias, also in cases of chronic alcoholism, there is seen at the autopsy table a wasting of the gray and white medullated structures that is usually diffuse, less frequently localized in one or more lobes. In the majority of such cases there is compensatory thickening of the soft membranes upon the surface of the brain with exudation of a straw-colored serous fluid into the arachnopial space.

The wasting of the tissues usually affects cortex, medullary matter, and the basal ganglia about equally, the result being that the gray rind is reduced perceptibly in thickness, while the ventricles become more or less widely dilated from shrinkage of the white substance and ganglia without any necessary granulation of the ependyma or inflammation of the choroid plexus.

When the membranes are removed, the convolutions are seen to be thin and pointed, or flattened when there has been considerable increase of fluid upon the surface, and on section the cortex is reduced in thickness. Microscopically within the gray layers the tangential bands are thinned, and the remaining fibres present an unusual degree of varicosity, while similar, though less pronounced conditions prevail within the medullary substance. The nerve cells are often pigmented, or show atrophic changes. The neuroglia elements of the star-rayed class show an apparent multiplication, resulting, possibly, from the disappearance of the other elements.

In some cases of paretic dementia the atrophy, while general, may be more pronounced in one portion of the hemispheres than in another; or the two halves of the brain may be unequally affected. Wasting is more frequent in the tip of the frontal lobes than elsewhere, and next in frequency come the motor region and occipital zones. Patches of markedly wasted convolutions are sometimes seen surrounded by other gyri in which a diminution of the substance is less marked.

Strictly localized atrophy signifies either an antecedent inflammatory process resulting from infection, or vascular lesion leading to closure of an artery, from thrombosis, embolism, or endar-

teritis obliterans. The thrombotic and endarteritic changes are frequent in senile dementias, but atrophy from an inflammatory process is rare.

SPECIAL PATHOLOGY.

PATHOLOGY OF THE NERVE CELL.

With the older methods of staining and preparation, the observer, at the end of his examination of a nerve cell, was always left in doubt whether the changes seen—unless indeed they were of the grossest nature—were artefacts or the result of disease. Even at the present time, about a pathological examination of the human brain much the same has to be said, though slowly the veil is being withdrawn and we are becoming able to distinguish the true from the artificial lesion. Much, or indeed the greatest part, of this progress, is due to experimental pathology where the tissue can be obtained in a perfectly fresh condition, and full control of the after-examination is possible.

Not only has the advance in experimental technique enabled us to determine definite changes in the brain cells of animals, but the increased knowledge of the architecture of the cell obtained from them, has rendered possible the recognition and interpretation, by relatively simple methods, of the changes found in daily microscopic pathological work. Experimental work upon the lower animals cannot be overestimated in its future effects upon the study of human pathological material, and accordingly becomes a factor of the utmost importance in the ultimate aim of all medical knowledge, the cure of the ills of mankind.

In the research work of the last decennary, three distinct divisions may be recognized according to the procedures employed. Thus we have (1) the Nissl alcohol-methylene-blue method; (2) the chrome silver method and its modifications, and lastly, (3) the customary hardening by chrome salts, alcohol, etc., with staining by aniline colors, hematoxylin, carmine and similar dyes. Before taking up the examination of material from the brain of man, let us glance for a moment at the results obtained by the first and second of the above special methods.

Nissl, Marinesco, Schäffer, Colenbrander, Van Gehuchten, Pandi, Goldscheider, Flatau, Dutil, Ballet, Sarbo, Lugaro and

others, have studied the changes in the granula and achromatic substance of the cell by the methylene-blue method, and have arrived at quite definite results. The alterations in the nucleus have been investigated with success, more particularly by Sarbo, Nissl, Marinesco, and the writer. The neuroglia cells do not show, by this method, their departures from the normal with equal distinctness as does the nerve cell, yet, under favorable conditions, pathological changes in them may be recognized with certainty.

The manner of experimentation upon the cell has been in two ways, first by bringing about indirect disintegration of the protoplasm of the nerve cell by section or ablation of the root fibres; for example, of the facialis or hypoglossus, the axone degenerating upward and downward, a secondary alteration of the protoplasm of the cell thereby being induced; or secondly, by directly acting upon the protoplasmic substance by toxins; alcohol, lead, phosphorus, the cultures of tetanus or other bacilli, the injection into the animal of irritant alkaloids (ricin, abrin), the poisoning of the animal by large doses of some common medicament, kalium bromide or morphia, or the temporary or absolute withdrawal of the blood supply by the ligation of a nutrient artery causing an artificial ischaemia.

Under the first category, where the nerve trunk is severed, and degeneration of the cell results, there is found chiefly an alteration of the chromophilic elements, attended by swelling of the corpus, and an excentric position of the nucleus. This displacement of the nucleus is always found where there is a denutritive process going on in the cell. The alteration of the chromophilic particles is shown by a breaking down of the granula into fine dust grains—a chromatolysis. The striped appearance of the cell is lost, and the staining now shows a uniform, light blue cloud, as if of dust particles covering the cell. The chromatolysis begins invariably at the axonal end of the cell and spreads from that point along the circumference. The progression of the chromatolysis in secondary alteration is accordingly from the periphery to the center. The alteration of the cytoplasm begins about forty hours after the section of a nerve, and lasts for a period of from fifteen to twenty days (Van Gehuchten), to give place to a restitution stage. Only slowly,

however, do the nerve bodies regain their normal condition, both as respects chromatin and volume. By the ninetieth to one hundred and tenth day the cell shows a complete return to the natural or pyknomorphous state.

With respect to the reaction of the achromatic substance, Van Gehuchten and Marinesco hold opposite opinions, the former finding no alteration, the latter stating that the achromatic substance also undergoes molecular disintegration, and becomes stainable. My own observations have led me to adopt this latter view.

In the primary degeneration of the cell protoplasm, from compression of the aorta or embolism, or from intoxications in the widest sense of the word, the picture of protoplasmic alteration varies considerably. In this artificial anaemia the breaking down of the chromatic particles begins, as a rule, at the periphery in the form of fine granular chromatolysis, accompanied by an oedematous condition of the protoplasm, which may reach a considerable degree (Sarbo). The cells take on the appearance of being covered by a cloud, the colorable substance is not sharply defined, and the remaining central chromatin particles look as if they were compressed together.

In the intoxication degenerations the picture is somewhat varied according to the nature of the poison. The most frequent one (after intoxications by the injection of certain bacillary products into the animal body, equivalent to an infectious process), shows a rarefaction and disappearance of the chromatic substance, mainly toward the periphery of the cell. In advanced stages one sees irregular masses of darkly stained particles, or even an entire pulverization and equal distribution through the protoplasm of fine dust-like particles, while later on the formation of vacuoles in the cell-substance is noticed. The process is usually most intense near the axonal cone, where it is frequently impossible to recognize anything of the former cell-structure. The axis cylinder also shows alteration, having a light granulation and greater receptivity for the coloring matter. The process may indeed exhaust itself entirely in the neighborhood of the axonal cone, the remainder of the cell presenting an almost normal condition of the granula (Van Gehuchten). In other instances the whole of the peripheral portions of the cell

show distinct chromatolysis, while the central regions are uninvolved. At other times, again, although the whole central region of the nerve body shows chromatolysis, the peripheral portions retain almost their normal aspect. Still other forms of poisoning show deformation of the granula, and partial chromatolysis; or the granula lose the sharpness of their contours, are much smaller than normal, lose their regular position in the cell, and look as if they had been packed into an irregular mass. Fibrillar substance and nucleus are strongly stained, a fact which indicates a profound disturbance of nutrition.

When the changes have not been very intense, the nucleus showing but slight disturbance, a *restitutio ad integrum* in the cell is possible, but in such cases the functional activity begins again long before the histological alterations have entirely disappeared. The pathological alteration in it is, therefore, no positive indication that the cell was incapable of performing at least a portion of its usual functions, a fact which is quite in accordance with our conception of the minor importance in the cell life of the granula. It is far otherwise when other changes are accompanied by indications of alterations in the achromatic substance and nucleus. This latter portion of the neurone is, of all its component parts, the most important, and the one from which we can draw positive conclusions as to the actual functional activity of the cell up to the time of death.

In comparison with the chromatin structures, the nucleus has been given but little attention in its intimate details by most of the writers on experimental cell-lesions. This is probably owing to one of two causes; either the chromophilic substance and clear caryoplasm are seldom altered in mild forms of intoxications, changes being absent from the nucleus except in the final stages where the protoplasm is actually disintegrating; or, the finer alterations of the vesicle are overlooked in the commonly-used Nissl stain, as it affords very poor definition to everything in the vesicular contents beyond the nucleolus.

Friedmann in 1891, writing on the degenerative lesions of the ganglion cells in acute myelitis, states that dentrites and nucleus conduct themselves absolutely passively in the process of cellular necrosis; and that they do not die simultaneously with the cell-substance and nucleus but subsequently to its death. Friedmann

is of course in error. All portions of a cellular structure are subject to the same laws governing their growth and death, and while the periphery may antedate in its breakdown the central regions, cell-destruction, provided the injurious process is sufficient to occasion death (acute anaemia from thrombosis, for example), progresses from the periphery toward the center until all portions of the protoplasm are involved. Again, Strobe, in 1895, in analyzing the literature of degenerative and regenerative processes in the central nervous system, gives the cell-nucleus only the most scant attention. In his description of nuclear alterations he mentions loss of the sharply rounded contours of the vesicle, loss of the definiteness of the contours, so that nucleus and protoplasm are no longer sharply differentiated, and certain chemical changes in the caryoplasm by which there takes place a greater absorption of the staining material. He regards variations in the position of the nucleus in the protoplasm as an evidence of the presence of a degenerative process.

Sarbo, in 1895, in an experimental work on the pathology of the ganglion cell after ligature of the abdominal aorta, shows conclusively that nuclear changes are to be found at any stage of the degeneration induced by the artificial ischaemia. In the early stages of cell-deterioration, the achromatic substance becomes homogeneously stained, the dark nucleolus remaining sharply defined, while the borders of the nucleus are blurred and lost in the dull blue of the changed protoplasm. At a later stage the nucleus takes up large quantities of the dye, progressively grows smaller, and stands out sharply from the surrounding cellular substance. In the final stage, when vacuoles are beginning to appear in the protoplasm, which is in process of disintegration, the nucleus loses its rounded or oval form, becomes angular, grows smaller and smaller, until nothing remains but a pin-head dark colored point in the center of the shrunken protoplasm.

In my studies on the action of ricin and alcohol on the cortical nerve cell, I found a most intense and definite change in the nucleus, which had not been previously described.

In the less pronounced forms, those found in acute and chronic alcoholism, the chromatin particles within the nuclear ring assume a coarser aspect, and the nucleus looks as if it had short sprouts protruding from its sides. In a more advanced, though

still early stage, the nucleus as a whole is somewhat swollen, and the buds from it have extended some distance from the central mass, and are now separating from it, though the line is still marked by the presence of fine grains in the caryoplasm. This nuclear substance has not become altered to any extent; possibly there is a little more absorption of the dye than natural, but it is not great. In further advanced examples, the outlines of the nucleus do not appear to be decidedly altered, but the chromophilic particles have among them a considerable number that are of unusual size and irregular form. The nucleolus is also swollen and covered by thickly-set chromatic granules that mark its form. Outside of the irregular masses of chromatin the caryoplasm is free from the usual dust-like grains, and has assumed a very refractile character.

In ricin poisoning, the nuclear changes are most pronounced, but of a similar order to those from alcohol. In staining with Heidenhain's hematoxylin the nucleus assumes a uniform deep blue, loses entirely its refractile properties, but is sharply differentiated from the protoplasm of the cell by the intensity of the staining. The outline of the nuclear ring has not altered perceptibly, beyond the fact that it does not stand out sharply, the edges are not serrated nor thickened, but within are a multitude of deeply stained, extremely fine, dust particles, with the caryoplasmic substance between them almost as deeply stained. Imbedded among the stained dust particles one no longer sees the ordinary single nucleus, but either one or several large corpuscular bodies that fill up a considerable portion of the ring, all highly stained. These chromophilic bodies are round or irregularly rounded; they are sharply defined, and occasionally there is the appearance of a vacuole within their substance. One, two, three, or more of these bodies are found within the ring, the most common form having a single large corpuscle looking like a huge altered nucleus filling up more than half of the nuclear ring, and surrounded by caryoplasm filled with dust grains. It is not entirely clear in what manner these large intranuclear bodies arise, whether they are formed by a tumefaction of already present nucleoli and adnucleoli, or whether they are composed of aggregations of metamorphosed molecular dust particles. In some, one might suppose an extreme swelling of the nucleolus,

but in others there are several almost equally large corpuscles, and we cannot presume, at least there is no warrant for the supposition, that all these bodies have arisen by a process of budding from a single center. It is more probable that the nucleolar bodies are formed from the nuclear molecular particles which have aggregated together and fused, leaving the caryoplasm free from dust, but at the same time changed in properties, as is evidenced by the greater absorption of the dye.[3]

In a recent work by Wright, on poisoning by bromides, the material being both human and experimental, almost precisely similar alterations to those above mentioned were noted, but besides there was a crenation of the nuclear ring, while in some places the nuclear margin was hardly distinguishable owing to the deep staining of the whole mass.

The most recent works on cell-degeneration, those of Lenhossék, Marinesco, Flatau, and Ballet, all mention the excentric position of the nucleus as an indubitable proof of an existing lesion. The nucleus may pass to the extreme periphery of the protoplasm, and even raise a hillock upon its side. These authorities also state that the nucleus becomes at first swollen, and diffusely stained, but there is no account of the deportment of the chromatin contents, or of the caryoplasm, beyond that it assumes a diffuse staining.

Studies by the Nissl method upon material obtained from the autopsy table have not been fraught with the same positive results that are obtained in experimental investigations. This is probably due to minor post-mortem changes beginning within the first few hours after death. Nevertheless, the results have not been without interest. Nissl has extensively investigated the cells in brains of those dying of dementia paralytica and other mental diseases; and in this country, Meyer, Hoch, the writer, and others, have obtained some fair results from similar studies.

The limits of the application of this especial stain in the human being are very narrow, and only when the material is of the most immaculate freshness can positive details be hoped for. This has been very definitely shown by Campacci, who killed guinea-pigs by bleeding, and left their bodies at a temperature of 72° for from three to twenty-four hours, and then examined

[3] Vol. VI, Johns Hopkins Hospital Reports, No. 1.

the nerve cells by the Nissl method. The granula become paler and paler as post-mortem changes set in; they show an irregular disposition, mainly ranging themselves around the nucleus, in a whirlpool arrangement, leaving the periphery without chromatin. In advanced stages (24 hours) the granula disintegrate into a fine blue-stained dust, and the protoplasm shows the presence of vacuoles. The protoplasm also shows irregular networks and meshes, and eventually presents a cheesy aspect. The nucleus is not entirely spared, it becomes lighter and less distinct in its contours; the chromatin fibrils are lost, and in their place appears dust detritus. The nucleolus is the most resistant portion of the cell, and only in the advanced stages of cell-decay does it lose its chromatic properties and wander to the periphery of the vesicle.

As a mark of chronic progressive decay, Nissl, in 1896, laid stress upon the pigmentary degeneration, and breaking up of the protoplasm with alterations in the nucleus of the cell. The morbid process, when intense, ends in necrobiosis of the entire cell body, the corpus retaining its form owing to the accumulation in its substance of calcareous deposits. These chalky concrements show themselves in the cell cytoplasm in the form of finest granules, or in plates or masses, which take an intense staining with methylene-blue. The whole, or only a portion of the cell, may become calcareous; not infrequently the process is confined to parts of the dendrites, or even to the nuclear membrane.

In his later writings (1898), Nissl admits that he is skeptical as to the value in mental diseases of minor alterations of the cell protoplasm, such as differences in the staining qualities of the granula, or a breakdown of the same, since these alterations are found in the brains of individuals who have exhibited no signs of mental disturbance. Nor is he willing to draw any close deductions from one type of cell-degeneration when the clincial pictures that result are so extremely varied. Even in the experimental work on animals this is also evident, since section of a nerve trunk, and toxic substances acting directly upon the cell, produce almost precisely the same forms of alteration.

The lesions most frequently mentioned by the writers on pathological investigations by the methylene-blue method, are: (1) pigmentary degeneration of the cell body with dissolution

of the granula, a more or less positive lesion; (2) reduction in size of the granules to dust particles, eventually chromatolysis, leaving in places areas of an almost homogeneous character with general swelling of the body; (3) irregular gyration of the granula (undoubtedly a post-mortem alteration), and over-staining of the achromatic substance.

The value of alterations of the nucleus is much more positive. In very many cases of mental disorder I have been able to demonstrate a dislocation of the nucleus to the periphery or even into the primordial process. In other instances the nucleus has appeared swollen and the caryoplasm rarefied. Sometimes the reverse occurs; the nucleus diminishes in size, becomes irregular in outline, stains more deeply than normal, and eventually may atrophy to a small irregular mass. Alterations of the membrane are also found; it may be thickened, irregular or serrated in outline, with local calcareous deposits along portions of its margin. Sometimes the chromatic contents also suffer. The threads may either swell, or diminish in size and show loss of staining properties. The caryoplasm may take up considerable quantities of hematoxylin or aniline stains, and present a homogeneous appearance. Rejection of basic and acceptance of acid stains rather frequently occurs in advanced disease of the cell. Dust-like grains may be strewn through it, giving to the previously clear substance a uniformly dotted aspect. The nucleolus, too, the portion of the cell most resistant to the influence of deteriorative agents, not infrequently shows the presence of irritative or degenerative processes. It may be uniformly enlarged, while still retaining a smooth outline, or it may swell, and the edges be roughened and spongy. It may wander to the margin of the membrane, or may become of an oval or horseshoe form, and occupy a large part of the nuclear ring. Finally, its central core may show, in disease, a difference in the receptivity of the dye from that exhibited by the more external portions, taking now the acid stains, in the place of the basophile ones.

It is often impossible to interpret correctly the significance of all these varied lesions. Many of them, probably the majority, are induced directly by the insufficiency of the supply of nourishment to the cell body, others by the irritant qualities of a virus

permeating from the blood channels, as in syphilis or chemical intoxications. In conclusion, it may be said that the pathology of the nucleus is far more definite than that of the protoplasm, and while at the present time we may not be able to correctly interpret the meaning of the lesion, we at least are able to recognize when the most important portion of the cell-structure is involved in a degenerative process.

The staining of the entire neurone by the chrome silver method of Golgi should apparently offer a splendid field for pathological research. But while this is entirely true for experimental work, unfortunately, when we come to the brain of man, we are again hampered by factors with which we do not have to deal in the lower animals—the presence of post-mortem products, and the difficulty in obtaining fair staining of the preparations. Again, the cellular changes shown by the method, while of extreme importance, are limited, being lesions of a gross character, none of the finer detail of the nucleus or protoplasm being brought into view.

The chrome silver staining shows conclusively that the neurone body degenerates from the periphery to the center, the finer portions of the dendrites being first attacked, and later the corpus. The form of degeneration is extremely constant, both in artificial anaemias and in intoxications. The degeneration may take place in an extremely limited time, twelve to seventy-two hours, as in ricin poisoning[1] where the lesions may be graduated in severity according to the amount of poison administered, and according to the duration of the poisoning.

The research field in this department has been occupied by only a few investigators, among whom may be mentioned Golgi, Monti, Ceni, Vincenzi, Wright, Scagliosi, Agapoff, the writer, and a few others. The articles most convincing are the one by Monti on artificial embolism, and that dealing with the ricin work above referred to.

In the earliest stages of the action of any strong cell poison, numerous swellings appear on the dendrites while the intervening portions of the stems retain their normal calibre. The gemmules over these thickenings soon show signs of disintegration, losing their property of reacting to the silver salt, and fall-

[1] Johns Hopkins Hospital Reports, vol. VI.

ing off from the parent stem, which, in these places, is soon left bare. As the destructive process extends, larger tumefactions grow out of the dendrites close to the cell body, while at the same time the outermost branches begin to disintegrate and break up. Finally, the neurone is reduced until the dendrites are mere stumps, varicose and atrophied, the gemmulae have almost disappeared from them, and the cell body, while still retaining its pyramidal form, looks rounded and tumefied. Complete destruction of the corpus of the neurone is rarely witnessed by the observer, but for all functional purposes the cell may be considered as inert, although it still retains its axis cylinder and collaterals either intact or but slightly swollen.

The mental condition of the animals that form the subjects of the experimentation is not uninteresting. For hours before death they are absolutely lethargic, sit huddled together in their cages, take no notice of external stimuli, and recover themselves with difficulty when displaced from their sitting position.

Precisely similar conditions of the nerve cells have been found in diphtheria, tetanus, serum and other toxaemias, as are demonstrable after artificial embolism and ricin poisoning.

As already mentioned, the chrome silver method applied to the cortex of man has not been prolific of good results. The post-mortem changes interfere in somewhat similar fashion here as with the methylene-blue stains. In the freshest and best obtainable preparations the alterations in the cell are never so pronounced as those found after ricin poisoning or the induction of acute anaemia.

The alterations in the neuroglia structures, as brought out by the various methods of staining, particularly the chrome silver method, and under certain pathological states, by carmine and safranin, are distinctive and interesting. According to their anatomical character, whether they are support cells, or belong to the lymphatic system, the cells conduct themselves entirely dissimilarly in disease.

In all forms of infective processes, both by the silver and safranin stains, the bodies of the vascular neuroglia (podasteroid glia) cells appear swollen, with more or less thickening of the pseudopod and other tentacles. Under these conditions within the margin of the extravascular space, particularly near the apex

of the conical foot, deposits of a granular detritus are found which would seem to have been ejected from the footed extension. By the same methods the cell is seen to increase in size, and when the process is very severe, to break down into detritus. With the safranin stain, in instances in which there is extensive destruction of the brain cells going on in subacute form, in dementia paralytica or cerebral syphilis, for example, the neuroglia of the vascular system, which under normal conditions is not visible in the section further than as indicated by the presence of its nucleus, shows decided enlargement of the protoplasm, and an equally striking change in its tingibility. Everywhere through the preparations, but in particular within the three outer layers of the cortex, these glia cells are seen sending their swollen tentacles to the margin of the vascular space. Besides the swollen condition of the bodies, another change occurs. Both tentacles and cell body are now filled with minute grains deeply stained by the aniline, and in the perivascular space similar particles are noticed. The presence of the stained molecules is most noticeable in the pseudopod, where they are arranged toward its central portions in a somewhat thick row, indicating that the process is channelled. The most striking pathological example, to be found in the literature, of the absorption of foreign material into the bodies of the vascular neuroglia is one by Binswanger and Berger. In their case, after a subarachnoid hemorrhage, blood pigment was extensively found in the bodies and tentacles of all the neighboring cortical cells of this glia type.

The further deportment of the vascular neuroglia cells in disease seems to be similar to that of the actual nerve element. In destructive lesions of the tissues of the brain substance they die and are removed by a process of gradual disintegration and absorption, so that they are no longer found where there is advanced sclerosis of the part.

The support cells, on the other hand, seem to possess much more vitality than their sister elements. In the sclerosis which follows so many forms of degenerative lesion of the nervous system, in place of dying out and being absorbed, they, apparently, multiply and proliferate until they form a thick felt-work of matted fibrillae, among which an occasional nucleus may be seen.

In nearly all the degenerative types of insanity, when there is

advanced destruction of the cellular elements, this multiplication of the neuroglia fibrillae is found, especially in general paresis or syphilis of the brain, where there is evident macroscopic shrinkage of the tissues of the cortex. In the white fibres at the foot of the convolutions where the cells become sparse, under these conditions, there is often the most extensive felting of the fibrillae.

CELL-DEGENERATION AS SEEN WITH ORDINARY STAINS.

Very varied types of nerve cell-degeneration are found within the cortex by the ordinary carmine, hematoxylin and aniline stains, but unfortunately it is very difficult to distinguish if they are of primary or secondary origin. It is certain, however, that they mainly follow a primitive lesion of the blood-vessels.

The most frequent form of pathological alteration found in the brain cells is the *fatty-pigmentary*. Nearly all large cells of the cortex after middle life normally contain small deposits of golden-yellow granules, with a number of darker ones scattered among them. This substance, usually designated as fatty pigment, but with which it has really nothing in common, since it belongs rather to a metaplastic change in the protoplasmic structures of the cell; is unaffected by ether, by caustics or acids, but reacts to osmic acid, which stains darkly, not only fatty constituents of cells, but also certain albuminoid products. Hence one cannot say with any certainty that the granules are of fatty nature. Hematoxylin and aniline do not tinge it at all, nor is it acted upon by any other dye.

In many mental diseases, inclusive of paresis, senile dementia, and to a less extent chronic alcoholism, the pigment granules increase greatly in numbers, and from occupying but a small portion of the cell protoplasm, extend over considerable areas, pushing the nucleus before them—a condition which may be assumed from the further disposition of the cell to be pathological. The outline of the protoplasm is now not so sharply defined, and there is some enlargement and alteration of the shape while tinctural alterations have taken place in the cytoplasm. The nucleus is at this stage not affected so far as regards outline or staining qualities, but a little later the basic stains are rejected, the acid stains are taken up, and soon the

corpuscle is forced to seek nutriment near the periphery of the protoplasm. Occasionally the nucleus takes up the pigment (Lewis) but in the final stages of the degeneration it always loses its vesicular outline, becomes more or less angular, stains too deeply, while the nucleolus shows in its center an enlargement of the bright refractile spot. Should the degeneration proceed to a greater degree, the granules of pigment take on a brownish hue, the nucleus shrinks perceptibly, and finally disintegration of the protoplasm occurs, resorptive processes begin, the pigment granules are seen strewn irregularly and loosely within the pericellular space, and disintegration is complete. A somewhat rarer transformation is for the cell to lose completely the yellow pigment; it becomes translucent, and almost invisible in the microscopic field. A considerable degree of pigmentary metamorphosis of the nerve cell implies vascular lesion, either a dilatation of the blood-vessels with choked extravascular spaces, or inflammatory processes in the sheath of the blood-vessels.

Simple atrophy of the cell is exceptionally found after vascular closure, embolism, or thrombosis. The body of the cell shrinks in all its diameters, the extensions assume spiral forms, the nucleus is indistinct, and eventually, after becoming roughened and excentric, disappears.

Coarse granular degeneration of the protoplasm is now and then seen after acute inflammatory processes. The cell body is tumefied and loses its sharp angles, while the cytoplasm shows, with hematoxylin or carmine, the presence of coarse angular particles, distributed through the mass, but more especially heaped up around the nucleus. The nucleus now becomes excentric, and is even partly or wholly extruded beyond the outline of the cell body.

Vacuole formation in the protoplasm of the nerve cell may be either the result of post-mortem disintegration, or of changes which have occurred in the cell from disease. In very fresh material the finding is a rare one, while in that from autopsies performed many hours after death it is frequent. In encephalomyelitis the formation of vacuoles is too distinct to be an artefact, but in general the round or oval holes in the protoplasm must be regarded as of trivial importance, and ordinarily of artificial production. After intense stimulation of the nerve cell

by the electric current, vacuolar openings in the cytoplasm are also found. Vacuolarization of the nucleus has been found in cases of epilepsy, but the change is not a constant one.

Colloid degeneration of the cell is most common in the neighborhood of foci of inflammation, or near the retracting borders of a hemorrhagic site. The colloid masses within the cell have a globular form, and stain deeply with carmine or hematoxylin.

Depigmentation of the cell is found in a number of chronic insanities where there is evidence of a sclerotic process. The characteristic fine granular character of the cell, seen with carmine or eosin staining, is lost and the body now appears homogeneous, less dye is absorbed, and the cell-structure is hardly to be differentiated from the surrounding matrix. Depigmentation and hyaline degeneration are closely allied to each other, and are supposed to mark the presence of sclerotic alterations in the cellular structures. In the final stages the cells atrophy.

A fine granular disintegration of the cell is noticeable after very numerous forms of toxaemic infection. The cells appear swollen, the protoplasm is cloudy, there is formation of fine and coarse granules within the protoplasm, aniline and carmine are feebly absorbed, even the nucleus resisting the staining by these reagents. This nucleus is often displaced, and finally becomes shrunken and irregular in shape. In the perivascular spaces may be seen large quantities of debris faintly stained by eosin, together with a material that blackens when osmic acid is used to treat the section. Broken-down leucocytes are also found in the vascular spaces, sometimes in such quantities as to completely pack the channel and seriously interfere with the return lymph flow.

Calcareous degeneration of the cortical cell is now and then found, after hemorrhagic exudations, obliterating endarteritis, trauma, and other irritating disturbances. The calcareous cells are readily distinguished by their peculiar refraction, and the distinct broken appearances of their processes. On the addition of an acid to the section, bubbles of carbonic acid gas are evolved, and characteristic crystals of lime salts are deposited on the surface of the tissue.

Alterations of the *nerve fibres* in the degenerative insanities are of frequent occurrence, and are particularly noticeable among

the tangential bands. The change most frequently consists in an extreme varicosity of the medullary sheath of the fibre, and sequent ill-defined retrograde alterations, the fibre as an entirety being removed. Acute swelling of the axis cylinder with extreme varicosity of the protecting sheath is found in any variety of acute encephalitis, in focal softenings following thrombosis from the plugging of the vessels by micro-organisms, and in abscess of the brain, from the destructive action of bacilli (for the most part the pneumococcus or colon bacillus) upon the tissue.

Lesions of the *neuroglia structures* seen with carmine and aniline staining are fairly numerous. One of the most striking alterations consists in a peculiar change in the power of these structures for absorbing the dye, so that they become more visible and distinct than under normal circumstances. Apparent multiplication of the nuclei of the stellate cells is found in the majority of diseases having a tendency toward atrophy and diffuse sclerosis of the brain substance, and many local processes also show an immense increase in the numbers of nuclei in the surrounding irritated tissue.

The vascular neuroglia becomes an object of importance in the microscopic field in diseases where there is a progressive destruction of the cellular elements, as for example, in progressive paralysis or senile dementias. Even in carmine specimens these elements stand out prominently in the field, show immensely swollen bodies and tentacles, and, ofttimes, within the body and arms, a finely grained detritus is to be seen, in all respects identical with that in the adjacent perivascular spaces. When overladen with the products of the catabolic metamorphosis, and particularly when the nutrient arteries are markedly diseased, these neuroglia cells follow the lead of the nerve elements, and break down into molecular fragments. Their power of resistance to the toxic processes is manifestly greater than that of the nerve element, but less than that of the long-rayed spider cells which maintain themselves, and form felt-works of filaments under the most adverse conditions. One of the most striking pictures of alteration in any tissue is seen in the early stages of paretic dementia when the myriads of podasteroid cells along the margin of the vessels become visible under low powers, with the swollen footed processes attached to the margin of the vessel sheath.

PATHOLOGY OF THE CEREBRAL ARTERIES AND VEINS.

Of the many morbid processes that weaken and injure the sheaths of the arteries, the condition known as arteriosclerosis, or arteriofibrosis, is by far the most wide-reaching in its effects, as well as the most frequent. It is found at all periods of life from adolescence to old age, and assumes several forms, which lead eventually to fatty and calcareous changes in the innermost layer of the vessel.

The causes of arteriosclerosis are very numerous, but the mode in which they induce the vascular disease is not known. As a rule it may be stated that any irritant poison circulating in the blood—alcohol, uric acid, syphilis, gonorrhoeal poison, the toxalbumins, etc.—are followed in a certain number of instances by chronic arterial disease, and it may be assumed that at least a certain number of these toxins act directly upon the inner coats of the vessels, and induce tissue degradations. Experimentally we know that the poisons engendered in lyssa and other infections, as well as alcohol, directly occasion degeneration of the middle and inner coats, from which it may be inferred, for the human being, that in similar affections, after the subsidence of the disease stress, there is not recovery, but a progressive degeneration of the elements of the several sheaths.

Other factors besides those of toxaemic source may enter into the causation of the disease. In a large number of individuals of mediocre mental ability, the arteriosclerosis begins at a very early age, and without any apparent immediate exciting factor (beyond the usual diseases of childhood). In such cases it is evident that the quality of the arterial tissue which the individual has inherited must be bad; indeed, entire families have been known to show this early tendency to fibrosis, which cannot be explained on any other theory than that of direct inheritance.

Furthermore, any element that has a tendency to lower the vitality of the tissues may be a factor in producing the arterial degeneration, whether it be unhygienic surroundings, insufficient or bad food, or continued overwork, especially that of the muscular system, which causes an increase of the peripheral vascular resistance, thereby elevating the blood-pressure. Over-feeding, though mentioned among the causes of arteriosclerosis, cannot

be a frequent factor, although over-distension of the blood-vessels, when unusual quantities of food are taken, and a too large supply of fatty material is admitted into the blood, might be considered as an inciting cause. In the arteriosclerosis accompanying renal disease, in some cases the alterations in the arteries have come on first and have induced the lesion of the excretory glands, but that in other instances, the renal disease has been primary and has brought about the arteriosclerosis, can be readily understood when we consider that in certain forms of nephritis, the changes in the kidney with the subsequent imperfect elimination of effete matters from the blood, must necessarily exert a morbid influence similar to that of an irritant poison upon the vessels, causing degeneration of their component tissues.

The division of the forms of arteriosclerosis into three classes by Councilman is more comprehensive than that of Thoma, though the several varieties occasionally overlap one another, showing that the same etiological agents are common to the different types. Councilman distinguishes a *senile*, a *nodular* and a *diffuse* arteriosclerosis.

In the *senile* form, there is marked thinning of all the coats of the artery, but the media is particularly involved. The muscular fibres have become hyaline, and finally by the deposit of calcareous matter in the degenerated tissue, the whole artery is converted into a thin rigid tube, having a slightly greater diameter than the former healthy vessel. The endothelial tissue also undergoes degradation, and breaks down in focal areas with formation of the so-called atheromatous abscesses, the contents consisting of tissue debris and cholesterine crystals. The outer portion of these foci are covered by a thin pellucid deposit of lime salts overlaid by a layer of fibres derived from the sub-endothelium. These atheromatous foci may be thickly scattered over the interior of a vessel, or may be sparsely disseminated. They give the internal aspect of the artery a roughened appearance, and frequent fissures may be noticed in the calcareous plaques, which may form lodgment points for the beginning of thrombotic deposits. The atheromatous foci, or abscesses as they are called, may rupture into the lumen, and the thinned wall of the vessel affords a favorable site for the beginning of aneurism.

In extreme instances the greater portion of the intima may be covered by the rough calcareous plates. The adventitia is involved in the lesion but to a limited extent, there being slight atrophy with changes in the nuclei. In the capillaries the degenerative change is less distinct than in the larger vessels. The latter are dilated, tortuous, their sharp outline is lost, and the nuclei become less numerous than in health and indistinct. Calcareous deposits form in the walls, and in advanced instances there is calcification of the entire tube.

The *diffuse* form or arteriosclerosis is the most important one, and extends without delimitation from the aorta to the finest capillary of the brain. Foci of atheromatosis are not necessarily present, but are usually seen, when the disease is chronic, in the wall of the principal branches of the brain arteries, and may be traced from them into vessels that are just visible to the naked eye. Great variation is found under the microscope, in the appearance of the smaller vessels, some being greatly affected by endarterial change with narrowing of the lumen, while others show only disease of the media, and little implication of the intima. It is probable that Thoma is correct in his division of arteriosclerosis into two forms, (1) that in which there are local changes in the large arteries leading to dilatation, and a compensatory increase in the structures of the intima, and (2) arteriosclerosis secondary to resistance to the blood-flow in the terminal vessels. This last condition is not infrequently found in the basal vessels, when there is a disease of the end-arteries of the cortex and ganglia, the increased resistance to the blood current leading to thickening of the intima of a compensatory order in the larger vessels. The arteriofibrosis is found at any age after adolescence, the youngest of Councilman's cases being twenty-three, the oldest a man of sixty. Associated with it is a varying degree of heart hypertrophy. In a few imbeciles I have noted it at the age of twelve years.

Microscopically the lesions consist of a hyaline degeneration of the media, which now has a uniform homogeneous or light striated appearance, the muscular and connective-tissue elements having undergone complete necrosis and metamorphosis into the neoplasm. Associated with the changes of the middle layer there is usually increase of the subendothelial connective tissue

of the intima with nuclear proliferation; the better marked the lesion of the media, the greater the increase in the thickening of the intima. Exceptions to this rule are occasionally met, where there is great hypertrophy of the faintly-striated hyaline material without decided changes in the intima. The membrana fenestrata suffers in varying degree in this affection of the artery. It may be unaffected, or may totally disappear; it has been known even to reduplicate itself, two elastic layers being present. In some not far advanced instances, traces of the muscle fibres are seen in the hyaline neoplasm of the media, their nuclei being distorted, as well as showing in other ways the presence of a destructive process.

The adventitia plays but a small part in the disease process. There is ordinarily some slight multiplication of the fixed nuclei of the lamina, but little encroachment upon the perivascular space.

When the intimal changes are advanced, particularly in the smaller arteries and arterioles, there is narrowing of the lumen from the endothelial proliferation, which may progress to complete closure of the lumen of the vessel—endarteritis obliterans—with great disturbance of the function of the part of the brain supplied by the artery.

Macroscopically the arteries are tortuous, do not collapse when divided, while the intima may be smooth, showing very slight changes to the naked eye; or, more frequently, there are elevations of a pearly-white color, and of a cartilaginous consistency; or these may be of an opaque whitish-yellow color, with the center soft and filled with a mortar-like mass of cellular debris and cholesterine. In extreme instances of arteriosclerosis there may be a high degree of calcareous degeneration of the media, the whole layer now being converted into a cylindrical tube of chalky matter, through which the intima is not visible. In sections of the tissue, these calcified arterioles stand out from the substance as fine white needles which have a gritty feel under the microtome. The addition of a concentrated acid to the specimen, placed on a slide under a cover-slip, evokes the production of numerous bubbles of carbonic acid gas. In high degrees of calcareous degeneration the adventitia may become involved, chalky off-shoots from the media extending into this lamina.

The last form of arteriosclerosis commonly recognized, the so-called *nodular* form, has its main interest in the circumstance that it is closely related to the preceding variety, and is sometimes coexistent with it. In the early stages, the internal sheath of the main arteries contains numerous flat projections of a yellowish-gray color, rounded in outline, and more frequently situated near the bifurcation of the branches than elsewhere. In advanced stages these patches undergo fatty-atheromatous alteration, a calcareous crust is formed on the surface, and the tissue beneath undergoes softening and breaks up into granular material. Embolism of an artery can take place from the detachment of one of the atheromatous plates from its deeper attachments, but the formation of emboli from this source is infrequent.

The microscopic appearance of the patches indicates the primary occurrence of a mesarteritis and a periarteritis, there being a local infiltration of these layers usually about the orifices of the vasa vasorum, with later changes in the intima. The formation of the atheromatous plaques is shown by Thoma to be in the nature of a compensatory process, the calcareous nodular plaque filling up and strengthening what would otherwise be a weak point in the diseased intima. Aneurismal formation sometimes follows the rupture of the nodular button into the lumen, the blood-pressure dissecting and bulging outward the weakened wall.

Various other affections of the arteries are found in the brains of the insane, either alone or in combination with arteriosclerosis.

A *pathological dilatation* of the smaller arteries of the cerebrum is often found where there have been repeated congestions, in chronic manias or in general paralysis. The calibre of the vessel is now irregular (rosary dilatation), the vessel portraying a succession of short dilatations and apparent constrictions. Miliary aneurisms are frequently found in the smallest vessels that have been subject to this morbid dilatation, but their frequency and importance as a cause of cerebral hemorrhage has been overestimated. They are found also in any vascular disease which engenders a local weakening of the arteriole wall. The rosary dilatation is caused by loss of tone in the muscularis.

Fatty degeneration of the muscular fibres of an artery is a

lesion of importance. In the earliest stage of the process refractile fat particles are seen between the single muscular strands, which at a later period become cloudy; the nucleus assumes an irregular outline, loses its staining qualities, and soon disappears, leaving the middle lamina a mass of yellow fat granules. The adventitia and intima are not implicated. The lesion is found occasionally in the arteries, both in youth and extreme age, and its pathological importance is uncertain, beyond that it causes weakening of the vessel and tendency to hemorrhage.

Except as a result of infectious processes, primary degenerations of the *endothelial layers* are infrequent. The secondary forms are numerous and sequential to arteriosclerotic or specific disease.

After ephemeral fevers, or other intoxications, degeneration and necrosis of the nuclei and connective-tissue elements of the intima are of extreme frequency. The affection usually ends in recovery, but there is occasionally an overgrowth of the fibrillary tissues and some narrowing of the lumen of the artery. Endarteritis of syphilitic origin is of great frequency, but will be treated of more in detail in the section on syphilitic lesions of the vessels.

The *adventitia* is usually affected when there is disease of the inner coats. Saccular dilatations of the sheath are seen when, from any local cause, there is interference with the lymph currents of the intravascular space. This dilatation is found more frequently in the white than in the gray substances, and when extensive gives to the tissues a cribriform appearance, the open holes representing the place of the dilated vessels. The condition is, however, rare.

Infiltration of the adventitial connective tissues with round nuclei and proliferation of the fixed elements is one of the most frequent lesions of arteries seen in the brain, both of the sane and the insane. It is more commonly found at the divisions of vessels that have been subjected to strain from fibrosis or repeated congestions. Periarteritis accompanies any irritative lesion going on in the vascular sheaths, but in some instances it appears to be independent of any other morbid process. Periarteritis is a most important lesion when the neoplastic formation interferes with the nutrition of the nerve elements by stoppage

of the lymph spaces, which in many instances is apparently the direct cause of the epileptiform seizures and serous apoplexies of frequent occurrence in the organic-degenerative forms of insanity.

The meshes of the adventitia may contain a variety of products of pathological import. Extensive collections of fatty granules are found in it in the neighborhood of apoplectic foci (small quantities of the fatty granules are normally found in the layer), or the pigment known as melanin may be massed in the meshes in large quantities, after previous attacks of severe malarial fever, as well as in some of the affections of the ductless glands. The pigment is located in the sheath of the vessel in the form of black or brownish fine, irregularly-scattered grains.

Lesions of the *capillary walls* are generally similar to those of the smaller arteries, though from their size, and the diminution in thickness of the sheaths, they are less pronounced and distinct. Dilatation and wavy contours are the most frequent coarse finding after congestions, while the fibrous degeneration accompanying arteriosclerosis is quite frequent (Lepinsky et al.).

The *veins* of the brain may participate in a number of the changes above described as appertaining to the arteries. Lesions of the intima are found after various toxaemias; or the media may undergo (in the largest veins) hyaline degeneration. Hypertrophy of the outer lamina is occasionally found, and, most frequently of all, we encounter a tendency toward nuclear proliferation in the outer sheath.

The contents of the perivascular spaces deserve mention before concluding this section. Lymphoid corpuscles, fatty particles, and sometimes pigment grains, are found in the normal space, but after the infectious processes the numbers of the leucocyte family, particularly the polynuclear variety, are occasionally found in countless numbers completely filling the space, sometimes to such an extent as not only to dam back the lymph flow, but also, by pressure upon the walls of small vessels, to impede the free current of the blood. Red corpuscles are not usually found with them, their presence indicating either the rupture of a vessel, or a pressure upon the weakened arterial walls sufficient to occasion diapedesis of these elements. In the extravascular space, under similar conditions, may be found the debris of de-

generating leucocytes, besides that thrown into the channel by the podasteroid glia cells, and a peculiar homogeneous large body, probably formed by agglomerations of broken-down white blood elements. Pus corpuscles may also be found in the lymph spaces adjacent to the cerebral surface after a purulent meningitis. In tumor growths of the meninges or brain substance various neoplastic elements may be found in the lymph spaces, the new formation following the line of these channels. Colloid-like masses staining faintly blue with hematoxylin, or red with carmine, are seen in the meshes of the adventitia or surrounding its layers. They are derived from the blood but are of unknown significance beyond that they are more frequently found in irritative than in purely degenerative lesions.

Hematoidin crystals and debris are frequently seen, both in the inner and outer lymph spaces, after repeated congestions of the cerebrum. Except when the quantity is very considerable and they help, together with the round-nuclear proliferation of a periarteritis or dense extravasations of leucocytes, to block the channel, their presence seems to be of little moment.

The *contents* of the arteries and veins are sometimes of considerable importance, though ordinarily, in an examination, the blood corpuscles are either normally diffused through the plasma, or located to one side of a network of coagulated serum that has expressed the corpuscular elements.

The vessels may be devoid of cellular contents, as is usually the case when the arteries are sound; or the blood corpuscles may be densely packed within the lumen (congestions, epileptiform crises). Under leukaemic or other physical conditions, the leucocytes may form plugs solidly packed in the vessel's lumen. Again, there may be thrombosis of the vessel from dense aggregations of parasites (malarial organisms, colon bacillus, etc.), or the vessel may be stopped by a detached fragment from a diseased heart-valve or bit of an atheromatous plaque, the last conditions affecting only the larger arteries.

In the several affections of the vessels coming under the head of arteriosclerosis, endarteritis, periarteritis, etc., the vascular disease is not always uniformly distributed over all the arteries of the cortex or ganglia. On the contrary, this uniform condition is rare, the majority of vascular lesions being irregularly

distributed, some arteries showing an intense degree of alteration, while others may be almost, if not quite, normal. Almost always the intensity of the vascular disease stress in the ordinary forms of arterial lesion falls within the territory of distribution of the middle cerebral artery, the probable reason being that the vessels are here larger and receive directly the full force of the cardiac supply.

SYPHILITIC VASCULAR LESIONS.

Luetic lesions of the brain tissues, chiefly in the form of inflammatory processes in the walls of the nutrient arteries, occur so frequently, and have in recent years attained such a pre-eminence that it is necessary to treat of them in some detail. Now-a-days whenever a case of tabes, general paresis, or one of the numerous other disorders that impinge upon both psychiatry and neurology presents itself, one naturally at once asks oneself whether the patient is syphilitic or not; a question that is usually answered in the affirmative by the physician, with the result that the patient is treated accordingly, until antisyphilitic therapy has at least been given a fair trial. Seldom in these luetic affections are there any positive indications of a focal character to the brain disease, though here and there disturbances of areas of cortex subservient to local motor-sensory functions are noticed to-day, but to-morrow arrives and they disappear, to be followed by symptoms of more general character.

Practically all the ordinary symptoms of general paralysis may be accounted for by the fact that there is going on in the brain tissues, a progressive alteration of the vascular walls, that reduces the supply of nutrient fluid to a minimum, and at the same time narrows the channels for the return lymph flow, inducing, at times (when there is a more rapid extension of the disease), oedema of the brain substance, and the peculiar seizures known as epileptiform attacks.

Primary syphilitic disease of the large vessels of the brain-basis presents some peculiar characteristics, which serve to distinguish it even to the naked eye from diffuse arteriosclerosis and other degenerations, though in fact many of these are indirectly caused by the luetic poison. At an early stage the blood-vessels lose their semi-transparent character; they become

opaque, and acquire a peculiar whitish cast, which later assumes a gray tint. On cross section a vessel no longer collapses, but remains triangular, or at least irregular in outline. To the touch the walls feel harder, and show a tendency to break on slight tension. On a closer examination of the lumen it is found to be narrowed to perhaps one-half of its former calibre by what is apparently a zone of newly-formed substance of gray or whitish appearance, which has a dry and cartilaginous consistency. Finally the lumen of the vessel may be entirely obliterated by the advancing growth of the new formation, or thrombi may form in the narrowed channel.

Other forms of syphilitic degeneration, or neoplastic formation, may now and then be found. Miliary gummata may be strewn along the periphery of the larger vessels, or the elements of the adventitia, nuclear or fibrous, may proliferate, enclosing the vessel in a thickened sheath which gradually involves the inner coats, weakening the walls, and, by extension of the proliferating elements, narrowing the lumen.

Microscopically, at least three different processes are to be found in individuals afflicted with syphilis of the brain.

The first extensive study of specific lesions of the brain arteries was made by Heubner, in 1874, upon fifty cases of the affection. According to this writer's acceptation, the origin of the syphilitic new formation is to be found in the innermost layer (endarteritis luetica) where it develops between the membrana fenestrata and the endothelium. It begins in a proliferation of the endothelial cells, which continuously augment in numbers, and form a strong-felted lamina of spindle- and star-cells, into which round cells from the neighborhood of the mouths of the nutrient vessels (vasa vasorum) wander, so that eventually there is formed a granulation tissue similar to that of a syphiloma. This new tissue grows in two directions, into the interior and along the length of the arteries, and narrows their calibre as it progresses to a complete involvement of the vessels. In further course, there now begins an organization of the new formation, which assumes a structure similar to that of the original vessel-wall. The process stops after permanent narrowing of the lumen, or is carried forward to complete obliteration of the lumen of the artery, with degeneration into a fibrous cord, and the vessel becomes incapable of performing its vital functions.

The lesions described by Heubner as belonging to vascular syphilis are not the only ones that affect the intima in this disease. Morbid changes in the endothelial elements may, in numerous cases, be the fountain-source of an obliterating process, equivalent to the usual type of obliterating endarteritis, entirely independent of any round-cell outgrowths from the vasa vasorum (Koster, Friedländer); again, in cases of florid syphilis there may be outgrowths from the intima, equivalent to a local tumor formation with complete stoppage of the arteries from the new outgrowth of the multiplying elements.

In one case investigated by Alelekoff, death occurring about six months after the infection, there was found on examination of the Sylvian and other arteries, a large neoplastic formation almost stopping the arterial lumen. The tumor formation in this case began at single points along the intima, raising and separating it almost completely from the elastica, and by rapid proliferation closing the opening of the artery. The neoplasms were adherent at points to the fenestrata, but at others were quite separate, and the inner membrane was separated in folds from the media, the space between being filled with red blood-cells. The new formation was composed of spindle-shaped elements, with between them fine connective-tissue strands. In places where the process was just beginning, the intima was raised away from the elastica, and showed florid proliferation of the endothelial elements. The adventitia of these obliterated vessels was infiltrated with newly-formed cells, whose presence in the neighborhood of the vasa vasorum was particularly striking. The media, although to a less degree, was also infiltrated with foreign elements. In the smaller branches of the Sylvian artery an intense, but simple, endarteritis was discovered, which in many places had advanced to complete obliteration of the artery.

Baumgarten, in 1878, after a careful investigation of several cases of luetic arterial disease, found another condition of affairs in the vascular laminae than that described by Heubner. There was more intense disease of the adventitia than of the intima, and he therefore came to the conclusion that it is not in the innermost lamina that the inflammatory process starts, but in the connective tissue of the adventitia with its conjoined nutrient arteries, as well as in the muscular layer; and that secondary to

these follow the proliferation and thickening of the intima. Baumgarten writes only of the larger arteries, but in the straight arteries of the cortex no form of specific arteritis is more frequent nor more characteristic of the syphilitic poison than a profuse periarteritis, particularly when it assumes, as it very frequently does, the aspect of a periarteritis nodosa. Here, in but slightly advanced instances there is rapid multiplication of round cells among the proper fibrillar elements of the adventitia until not only are the meshes of the layer covered but also the whole extravascular space has become filled by them, and nothing can be seen of the inner coats of the vessel from the dense overcrowding of round nuclei. In the first stages, the adventitia alone is involved, but soon the media becomes infiltrated with the new elements, undergoes necrosis of the muscular cells with disappearance of the nuclei, and eventual transformation into a fibrillated hyaline material, not very readily noticed in the round-cell mass, which itself may later take on caseous degeneration, or, more frequently, partly disappears by an absorption process, leaving hematoidin crystals and debris to mark the former turgescence and nuclear overgrowth. Finally the intima takes on the cellular proliferation by simple extension of the inflammation; both fibres and nuclei increase and multiply, the lumen of the vessel is reduced in calibre, and if the degeneration advances, is eventually closed, though to the last there is retention of the innermost endothelial lining.

From a clinical standpoint this inflammatory process may be equally important, more rapid in its effects, and more lethal than the Heubner endarterial disease. In nine recent autopsies upon cases of dementia paralytica of specific origin the adventitial alteration was found in all in varying degree, from complete filling up of the perivascular space, to a much less pronounced form, in which only a cortical area here and there showed a decided degree of adventitial disease.

Greco, also, in 21 examples of the same mental trouble, found in all periarteritis, which in some had advanced to an obliterating endarteritis. Retrograde changes in the proliferated adventitia are always found if the case has been of long standing, and the muscular and endothelial alterations assume greater prominence.

The intimal thickening of Heubner must therefore be regarded,

not as he supposed as the characteristic lesion of arterial syphilis, but only as the expression of the implication of the intima in common with that of the outer layers of the artery.

In the very earliest stages of the periarterial process, the point of departure of the inflammatory trouble is unmistakable. At some varying place along the outermost sheath of the arteriole, a local increase of small round cells with a comparatively large nucleus and scant protoplasm imbedded in a fibrous matrix is seen. From this point proliferation extends and the adventitia and surrounding lymph space become filled with the cellular and fibrous elements, which overflow and permeate, not only into the media, but also into the surrounding nerve tissues, inducing degeneration of the cellular structures of various kinds, the podasteroid gliacytes particularly suffering. The media and intima are nearly always involved after the nodular periarteritis has advanced to any considerable degree.

As above remarked, this form is more highly characteristic of syphilitic infection than any other, arising primarily in the smaller arterioles, and not being secondary to any ascertainable disease of the tissue.

It has been found that the obliterating endarteritis so frequent in specific troubles of the brain, may be secondary to any interstitial degeneration, as in disease of the pyramidal tracts or tabes dorsalis; or it may accompany any chronic inflammation, and is then not to be differentiated from the luetic affection. Likewise any pressure upon the sheaths of the artery, acute, as in Baumgarten's ligature experiments, or chronic from the blocking of the perivascular channels by nuclei, crystals, and debris, may also induce an endarteritis which would appear to be of a compensatory nature.

In the terminal stages of the several described syphilitic degenerations of the arterioles, if the patient be so unfortunate as to live to reach them, there is resorption of the small round-celled infiltration, with shrinking of the fibroid elements of the adventitia, hyaline-fibrous degeneration of the media, in the larger arteries occasional duplication of the elastica, with more or less advanced narrowing of the lumen, owing to the fibro-cellular proliferation, and occasional formation of two or more lumina, or total obliteration of the vessel.

Another rather rare affection of the arterial system in long-standing cases of syphilis is a fibrous-hyaline degeneration and hypertrophy of the muscular layer without any considerable involvement of either the adventitia or intima.

This primary alteration of the main support sheath of the artery may proceed to such a degree, that the lumen is reduced in size to a capillary opening, or even entirely closed by means of granular material sometimes containing the debris of blood corpuscles, as if the blood within the vessel had undergone coagulation and afterwards partial organization. This condition is found not only in the larger meningeal vessels but also in the medullary tissue, and is of importance inasmuch as it necessarily deprives the underlying and surrounding tissues of their immediate blood supply. The morbid process is not uniform in the affected vessels, some being only considerably thickened, with the lumen remaining open, while in others, although a very minor number, it is completely obliterated.

The intrinsic condition of the media in the advanced fibrosis is most interesting. No trace of muscular substance is anywhere to be found in the greatly-thickened layer, which now is composed of fibrillae waving and twisting in a manner strongly suggestive of the involutions of the membrana fenestrata, so that until close examination is made it might be mistaken for a multiplied elastica. The fibrillae are not always arranged in such definite form, but twist and turn in a labyrinthine confusion; occasionally, however, a definite retained fenestrata may be observed entirely distinct and separated from them. The transverse diameter of an artery of very moderate calibre is often so greatly increased in size that it can be distinctly seen in the gray matter with the naked eye.

In the earlier stages of the process, on staining with fuchsin or safranin picric acid, the muscular cells are seen to be undergoing a definite hyaline degeneration, with disorganization and disappearance of their large nuclei. Then there begins a hypertrophy, by proliferation, of the fibrous elements, which, as the increase takes place, progressively narrow the lumen of the artery until it is too small to admit of an equalized blood current, or becomes filled with a granular half-organized mass. In not a few instances the fenestrata and intima have become separated

from the fibrous mass by a fairly broad space, containing hematoidin grains. Owing to the necessary shrinkage, due to hardening reagents, this space is probably wider in the preparation than it was in reality during life. In only exceptional places was the intima thickened at all, and in these to an inconsiderable degree. The outer layer is never implicated in the change to any considerable extent.

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A DIFFERENTIAL COUNT OF WHITE BLOOD CORPUSCLES IN A FEW CASES OF GENERAL PARALYSIS.[1]

By F. H. JENKS,
Asst. Physician, Elgin, Ill.

The cases selected for this report were taken from the hospital wards at random and the study was begun with the hope that something distinctive might be found to aid in the diagnosis of these cases in their early stages.

At first only a differential count of the white corpuscles was contemplated, but in all cases either an actual count of red corpuscles was made or they were estimated by the use of the hematocrit. Parenthetically, I will say that in all cases where I have resorted to both procedures the variation has been slight. In the preparation of the specimen for the differential count the following method has been used:

The lobe of the ear, after careful cleansing, was punctured and a small portion of the blood was spread on clean cover-glasses. Usually four specimens were prepared. After drying by passing the cover-glass quickly through the flame of a Bunsen burner, the blood was fixed by placing the cover-glass in a saturated aqueous solution of bichloride of mercury and allowing it to remain 5 minutes. When washed, the cover-glasses were then placed face upward on a blotting-paper and a few drops of stain spread over the glass, to remain from 1 to 3 minutes. The stain used was the Ehrlich tricolor stain.

The nomenclature followed is that of Cabot.[2] In all the cases the percentages were figured from a count of 500 white corpuscles.

[1] Read at the Seventh Meeting of the Association of Assistant Physicians of Hospitals for the Insane, at Cleveland, Sept. 26-28, 1899.

[2] Clinical Examination of the Blood, R. C. Cabot.

CASE 1. J. C. C. Admitted 3-15-1898. Age 45; Irish; married. January, 1897, he had a "nervous collapse, and was unconscious for 24 hours." There was evidence of syphilis, but history sheet says that "Some physicians have said that present trouble was superinduced by syphilis."

When admitted his knee reflexes were exaggerated and his pupils sluggish. He had delusions of grandeur. At time of examination he was sluggish and weak and with an idiotic expression. He did not seem to comprehend what was said to him. He died September 3, 1899, after a convulsion.

The percentages of the various corpuscles in this case were polymorphonuclear neutrophiles 76; eosinophiles, not any; large lymphocytes 3.4; small lymphocytes 20.6; red corpuscles in percentage tube of hematocrit 34. It will be understood that the first figure of the hematocrit percentage corresponds to the same number of millions of corpuscles in a cubic millimeter of blood; therefore in this case there were 3,400,000 corpuscles in a cubic millimeter. Observe that there were no eosinophiles. Capps,[1] of Philadelphia, has made the same observation in some cases, and the phenomenon seems inexplainable.

CASE 2. C. W. W. Admitted October 25, 1897. Age 54; Dane; married; lawyer; no insanity in family. Two years before admission he had what was called cerebral hemorrhage and convulsion (probably paretic seizure), since which time he has been more irritable.

On admission. No history of syphilis obtainable. Reflexes: knee absent; pupil sluggish. When his blood was examined March 3, 1898, he was unable to carry on conversation and talked disconnectedly. His physical condition was apparently good. He died March 23, 1898, after a series of convulsions. He had a convulsion the day after a blood examination. The percentages in this case were as follows: polymorphonuclear neutrophiles 64.4; eosinophiles .6; large lymphocytes 18.2; small lymphocytes 16.4; myelocytes .4. The red blood count resulted in 5,744,000 to the millimeter.

CASE 3. T. D. B. Admitted June 30, 1897. Age 42; American of Irish parentage; single; saloon keeper; no insanity in

[1] Journal of Med. Sciences, June, 1896.

family; no history of syphilis; reflexes normal. At the time of blood examination he was unsteady in gait and had a characteristic paretic speech. Everything is "all right" with him. Percentages were: polymorphonuclear neutrophiles 71.4; eosinophiles 3.6; large lymphocytes 7.2; small lymphocytes 17.8. Blood count revealed 4,751,000 red corpuscles to the cubic millimeter.

CASE 4. J. H. Admitted March 31, 1899. Age 53; English; marrried; bricklayer. Six years ago he received a severe blow between the eyes which is the cause assigned for trouble. There is no history of syphilis, unless a scar on his shin may be a result of tertiary manifestation. When admitted he had delusions of grandeur; "never felt better in his life;" also a characteristic paretic speech; his gait was slightly ataxic; his pupils contracted and fixed.

Blood examined July 15, 1899, 10.30 a. m.

The percentages in this case were: polymorphonuclear neutrophiles 74.8; eosinophiles 4.2; large lymphocytes 4.4; small lymphocytes 16.6; hematocrit percentage 39.

CASE 5. C. H. G. Admitted March 7, 1899. Age 43; American; married; no children; grain tallyman; no insanity in family; no history of syphilis; paresis of left arm. Assigned cause is fall from cable train February 28, 1898, as his first symptoms occurred two weeks later.

At the time his blood was examined his speech was that of a paretic. He appeared dazed; his gait ataxic. Pupils were asymmetrically dilated and sluggish.

Blood examination July 16, 1899.

The percentages in this case were: polymorphonuclear neutrophiles 74.6; eosinophiles 1.2; large lymphocytes 13; small lymphocytes 11.2; hematocrit percentage 35.

CASE 6. J. A. M. Admitted May 26, 1897. Age 52; American; married; insurance agent; no insanity in family; very intemperate; three previous attacks of insanity from which he apparently recovered; reflexes absent. At time of examination very unsteady gait. Will not speak. Blood examination July 17, 1899, one hour after dinner. Percentages were: polymorphonuclear neutrophiles 71.6; eosinophiles .6; large lymphocytes 7.2; small lymphocytes 20.6; percentage of red corpuscles in hematocrit tube 35.

CASE 7. A. M. Admitted June 16, 1898. Age 40; American; married; 1 child; barkeeper; nothing known of family history; syphilis when young; knee reflex, absent; pupil sluggish.

At the time of blood examination he talks with great difficulty and is growing more incoherent. He has had no paretic seizures as yet. His gait is very unsteady. He has prominent delusions of grandeur.

Blood examined July 18, 1899, one hour after dinner.

The percentages were: polymorphonuclear neutrophiles 63.6; eosinophiles 1.4; large lymphocytes 4.2; small lymphocytes 30.8; percentage of red corpuscles in hematocrit tube 43.

CASE 8. C. J. E. Admitted November 23, 1898. Age 40; American; married; no children; clerk; no insanity in family; no history of or evidences of syphilis; first symptoms appeared one year ago; delusions of grandeur.

When the blood examination was made he still possessed delusions of grandeur and was perfectly happy; his gait was slightly ataxic; slight tremor in muscles of face while talking; pupil reflex sluggish.

His blood was examined July 25, 1899.

Percentages in this case were: polymorphonuclear neutrophiles 69.8; eosinophiles 2.8; large lymphocytes 8.2; small lymphocytes 19; myelocytes .2; hematocrit percentage was 43.

CASE 9. W. B. Admitted February 3, 1899. Age 37; American; married; laborer; no insanity in family; has had syphilis; at time of examination his gait was ataxic; pupil reflex absent; speech characteristic of paresis. July 13 he had a paretic seizure characterized by loss of consciousness which returned within one hour, but he was aphasic for several days. August 3 had a convulsion which was followed by unconsciousness. His blood was examined July 28, 1899. Percentages were: polymorphonuclear neutrophiles 67; eosinophiles 2.2; large lymphocytes 13.8; small lymphocytes 17; hematocrit percentage 40.

A perusal of the table reveals that the polymorphonuclear neutrophiles are above the average proportion in cases 1, 3, 4, 5 and 6 and low in none. The column of eosinophiles reveals nothing remarkable except in case 1 where there are none. The large lymphocytes are abnormally high in cases 2, 5 and 9; abnormally low in none. The small lymphocytes are abnormally high in no case, low in cases 2, 3, 4, 5, 8 and 9, being very low in case 5.

The myelocytes are so few in cases 2 and 8 that they scarcely change the percentages of the other columns and undoubtedly were not found here because these cases are cases of general paralysis. It will be noticed that the red blood corpuscles are low in all cases except in No. 2.

The greatest abnormality in the white corpuscles in these cases is in the percentage of large lymphocytes in cases 2, 5 and 9.

In cases 2 and 9 the examination was made at a time when a paretic seizure was imminent, which corresponds with a conclusion arrived at by Capps,[4] who found that there is not only an absolute leucocytosis but the percentage of large leucocytes is increased.

Some other explanation must be made for this occurrence, as well as for the low percentage of small lymphocytes in case 5, as there had been no seizure in this case since he had been in the hospital, and there was no seizure in any of the other cases less than 4 weeks either before or after the blood specimen was prepared for examination.

Cases 2 and 9 seem to indicate that there is an increased percentage of large lymphocytes at the approach of a paretic seizure.

The red blood estimations in all but case 2 confirm Capps,[5] who says that the haemoglobin and red corpuscles are always diminished.

A comparison of these cases, as well as the averages of all of them with the normal percentages, will reveal nothing which would aid in a diagnosis of a case of general paralysis, but cases 2 and 9 indicate that there is an increased percentage of large lymphocytes at the time of a paretic seizure.

It does not necessarily follow that in all cases where there is an increased percentage of large lymphocytes a seizure is approaching (see case 5), but given a case of general paralysis with this increased percentage the suspicion of an approaching seizure is justified.

[4] American Journal of Med. Sci., June, 1896.
[5] *Ibid.*

TABLE.

Case No.	Polymorphonuclear neutrophiles.	Eosinophiles.	Large Lymphocytes.	Small Lymphocytes.	Myelocytes.	Hematocrit.	Blood Count.	Hours after Eating.
1	76.	None.	3.4	20.6	..	34	....	3
2	64.4	.6	18.2	16.4	.4	..	5,744,000	2
3	71.4	3.6	7.2	17.8	..	..	4,751,000	2
4	74.8	4.2	4.4	16.6	..	39	....	3½
5	74.6	1.2	13.	11.2	..	35	....	2
6	71.6	.6	7.2	20.6	..	35	....	1
7	63.6	1.4	4.2	30.8	..	43	...	1
8	69.8	2.8	8.2	19.	.2	43	....	3½
9	67.	2.2	13.8	17.	..	40	....	4
Average	70.3+	1.8	8.8+	18.8+	..	..	....	....
Normal as given by Cabot	62 to 70	.5 to 4.	4 to 8	20 to 30	..	..	....	....

WHAT THE CHRONIC INSANE CAN ACCOMPLISH UNDER PROPER DIRECTION.

By J. T. W. ROWE, M. D.,

First Assistant Physician, Manhattan State Hospital, Ward's Island, N. Y.

In the spring of 1889 a steamer of the Department of Charities and Correction, of the city of New York, carried from Ward's Island a draft of chronic insane; their destination being Central Islip, Long Island, where a tract of one thousand acres of as unpromising-looking a lot of land as the eye could rest upon, had been purchased by the Commissioners. It was a sandy loam; glistening white sharp sand beneath, and under that the famous water stratum of Long Island. The land was cheap, and near enough to New York to receive daily supplies, and additional drafts of patients from time to time; also, to send surplus fruits, vegetables, etc., to the institutions on the islands. It was covered with scrub oak, stunted pine, bunch grass and abandoned fox burrows, and intersected by scores of old, grass-grown woodroads which were jealously guarded by the rude forefathers of the hamlet, who considered they had vested rights in them. The natural products were ground game, vermin and wild berries. The unlimited run which this land promised; the enormous crops of vegetables, fruits and flowers, and never-ending sunshine, opened up a vista of unspeakable delight, after the long-borne overcrowding of the city asylums, with their limited breathing spaces, contracted "airing courts" and lamentably overcrowded dining-rooms.

The buildings were low, one-storied, wooden pavilions, facing the south; deluged with sunshine; and with long, low, sloping roofs with overhang, to keep off the driving storms.

The sitting-rooms and dormitories had large, high windows, giving an atmosphere absolutely free from the asylum odor. The dining-rooms were bright and cool and the tables were bounti-

fully supplied with vegetables and fruits, gathered the same day, by the hands of the inmates. Each dining-room had its pump outside the door, which tapped the ice-cold water-bed, twenty feet beneath, and furnished a supply for every meal.

Three groups of pavilions, an administration building, stables and storehouse, were scattered over perhaps, forty acres of undulating land.

The object of the colony was to provide a home for years to come, for the overflow of the great city institutions for insane; and for the able-bodied, quiet insane, a diversity of employment. The clearing of land and growing of crops would be a healthful change from the monotonous asylum occupations. The poor, demented patients from the sweating shops and tenements were to have a brighter existence, while partially supporting themselves, and as the colony grew, would furnish large quantities of surplus vegetables and fruits to the city institutions. Its realization seemed far off indeed, when hardly the mark of an axe or wheel was to be seen within that length and breadth of wild bush; yet, within four years, half of this great tract was cleared. Fields of grain, fruits and vegetables stretched as far as the eye could reach, and order and method were firmly established. Our first draft of forty patients and several attendants, with their lares and penates, reached their destination at eleven o'clock; and, fortified by a good dinner, made their maiden efforts at clearing the virgin forest; and awkward work it was.

The colonizer, like the poet, is born not made, but the patients stood to their task manfully, and soon cleared off a patch of scrub; put in such vegetables as peas, lettuce, etc., and by the end of June we had ten acres of grain waving in the breeze. A large kitchen garden had been planted, good roads had replaced rough tracks and the clearing was extending outwards and so protected against forest fires which periodically left a black waste behind them. By October, grain over six feet tall had been harvested; a tract of land half a mile in extent had been cleared, road-making had been pushed vigorously, and the men were becoming handy with implements and edged tools.

Our first winter passed comfortably, with no interruption to work; roads were immediately cleared after snow falls, so that the daily walks should not be interfered with. When unusually

stormy, inside work would go on, such as threshing grain, sawing wood, oiling boots, and broom-making by means of machinery of the most primitive construction. Living a patriarchal life in the wilderness, many novel as well as simple devices were born in them.

The patients painted the buildings, inside and out, and stored ice like Down Easters. Increased by additional drafts from Ward's Island, they began to show what was in them. Thoroughly organized parties, one attendant to fifteen patients, were put at work. The skilled were set apart; no man able to use a scythe, paint-brush, or saw, was put at laboring work; the drones were weeded out and suitable work provided for even them. A fine piece of work was the cutting down and removing of a hill of over five thousand tons, which was an eye-sore to everybody, and an obstruction on the public highway, compelling the farmers to partly unload at its base before attempting the climb. The material filled up a deep ravine near by, converting it into a charming lawn, and evoked everlasting blessings from the farmers who used the road. Knolls and rising ground were obliterated. A road, three rods broad, as straight as an arrow and a mile long, was next made. It was our boundary line and a sure stop to forest fires. More than a mile of fencing was then put up; plumb and workman-like. It was a daily sight to see thirty patients with well-hung scythes wading, breast high, into a fifty-acre patch of scrub; then followed the music of whetstone upon steel, and half would be cleared off by night. The great heaps of brush were next fired, and the ashes scattered about to fertilize the next crop. The tree trunks were hauled away by the ox teams to be used for posts and rails.

Twenty-five others, with chopping axes ground to a razor edge, tackled the standing timber. The air was filled with the crashing of falling trees, and the laborers would return in the evening, red-faced, and redolent of fragrant pine boughs. A hundred others with mattocks, would stub the roots out and put the land in condition for its virgin crop. Wherever a party of men worked, a pump was at once driven into the earth, and every working party had to show its water pail before starting to work.

Many thousands of tons of earth excavated in making the cel-

lars for twelve new pavilions, were used to grade uneven surfaces. Conduits, half a mile long, and broad and deep were dug. But our *magnum opus* was a stretch of railway leading three-quarters of a mile from the main line into the heart of the property. In this herculean work, cuttings four hundred feet long, forty-five feet wide and fourteen feet deep, were made; the material being shoveled to the top of the bank. Equally large fills were made; and every sleeper and iron rail in its construction was handled by the party. A monument to their labor is the site of the General Superintendent's residence—originally, nothing but a ragged hill, covered with scrub and torn by old water courses; clearing away the timber served only to expose all its ugliness. It was raised skywards and pushed outwards, the adjoining sand hills were laid under tribute and thousands of loads were carried to the work which looked like half-made military earthworks. Bold, curving terraces were projected outward from base to summit. About all, were graceful winding roads walled in by curving banks. Flanked by velvety green lawns, a plateau dotted with shrubbery crowned all, from which a magnificent view was got of the colony below, and of hills and valleys in the distance until lost in the Atlantic mists.

That is but a piece of the work done by the chronic insane. Where can anything approaching these results be seen? Things near home now received attention. A thirty-foot road encircled the grounds. Orchards and ornamental trees, coppices, groves and shrubberies were set out. All the resources of horticultural science were made use of. The lawns fairly blazed with flowers surpassing the most lavish luxuriance of nature. Each morning it was a perpetual refreshment and delight to walk about at dawn, the air laden with perfume; and how much sweeter the breath of flowers is in the air than in the hand. Too much weight cannot be attached to the importance of absolute cleanliness and order in the environs of an asylum. The joy in the smell of the earth lies very close to a man's heart, and the smooth shaven lawns and trim terraces, beautiful parterres, well-turned roads and gravel walks, everything clearly outlined, everything free from slovenliness—one will remember these with a feeling of pleasure, when the interior with its gimcrack furniture and tawdry wall decorations, are all forgotten. Nine out of ten have already judged the interior by the grounds.

The morale of the patients had by this time changed; red-faced, brawny fellows, their weight had increased; some formerly disturbing and talkative, had become quiet, and good workers; they slept soundly at night and a sleeping draught was rarely required.

Upon Saturday night, tub night, every man was shaved, soaped and scrubbed in the presence of a physician, clean clothes were given him, and he was put to bed, a cleaner and a better man.

Sunday morning, after close inspection, they started off on their mile march, clothes buttoned up, boots polished and with regular step, led with the greatest precision by two of their steadiest; to the wonder of the passers-by who stopped to view them. After dinner they attended church, made their responses and sang hymns with great fervor and enjoyment; afterwards perhaps exchanging felicitations with the chaplain on the beauty of the day and surroundings. In the evenings they would sit on the lawns or kick foot-ball, or listen to the fiddle or bagpipes. Once a week they had dancing galore. "Hornpipes, jigs, strathspeys and reels, put life and mettle in their heels." What a shout went up when a favorite, with unconventional abandon, stepped off to the air of "The wind that shook the barley," while a hundred pairs of feet kept silent accompaniment.

The attainment of these results with precision and harmony, required a most careful selection of the attendants. They were selected according to fitness, and nothing else. Only practical men who knew how to use their hands were accepted; many had seen military, or naval service, giving them a promptness of manner; or had worked on estates, bringing with them habits of discipline and order. They were strong and intelligent fellows, cooperating for the common weal, and each vied with the other in keeping his party smart and effective. Regulations were enforced to the letter; work began at the minute with no stop until bell call, when every implement was counted and stacked. Hours for meals and retiring were never changed, prompt attention was given at the table, and perfect order was maintained in the dining-rooms. Discipline was of a much higher order than usually prevails in an asylum, and it was not held sufficient to merely fill a uniform and loll about with patients. From cap to boot, every-

thing was neat and clean. There was an observant eye; a general air of smartness; a prompt, quick salute; with such attendants nothing was impossible.

Rigid economy was practiced, and waste prevented by unceasing vigilance on the part of officers and men. Supplies were inspected and promptly rejected if not up to the standard and an excellent *esprit-de-corps* existed amongst them. Men from the country about were tried, but were too slovenly and apathetic; there was no spring to them. It would take a good deal to alter my views, but I have a decided preference for the ex-soldier. The short service man with his vigor and discipline, makes an infinitely better attendant in every way. From long observation under many trying conditions, I know they surpass all others. In work or play, fair weather or foul, they respond cheerfully, and the patients look up to them and will do anything they are asked. Since all work and no play, makes Jack a dull boy, the work days were pleasantly varied by others of diversion. A month or so before a public holiday, an athletic spirit would manifest itself. Attendants and patients were getting ready for the field sports; tape-lines, hurdles and vaulting poles might be seen lying about the practice ground. And how they warmed up to it! On these occasions our nineteen-hundred-pound tug-of-war team, hairy chested as Norsemen, wrought enthusiasm up to the highest pitch and at their work displayed almost championship form. When the eventful day arrived, everybody worked under high pressure. At break of day the field flag, a big crimson ball on a white ground, floated lazily over the grounds. The course was swept and watered, seats and awnings were placed near the finish line and a cart-load or two of paraphernalia heaped about. In the afternoon every thing was *en fete;* all, clad in new suits, with shoes brightly polished, their tan faces glowing with expectation, marched to the grounds. After the employees and their families, and guests of honor were duly placed, and lemonade galore, had been passed down the lines, the contestants with huge numbers pinned on their chests, stepped out and toed the line. The pistol cracked, and away they went like a flight of birds; as they approached the finish, mouths open, and tongues out, all bunched together, deafening shouts arose; the string was broken; time was announced in

thunder tones; another flood of lemonade was let loose, and more slapping of backs. Several tugs of war were pulled to fearful "heaves"; the demoralized greased pig was caught in a whirlwind of dust; the wheelbarrow race showed what only a wheelbarrow can do in good hands, and the fat men, like Falstaff, larded the lean earth as they ran, blowing like bellows. Everybody received a prize and the day ended with candies, and the display of winnings. The gallantly-won flags graced the walls of their wards for many a long day afterwards.

It is gratifying to know that, notwithstanding their constant familiarity with all kinds of edged tools and implements, not an accident occurred during all that time. Affections peculiar to asylums and barracks were, owing to close medical supervision, considered very unusual.

With such results as are seen at this ideal colony for insane, their number should be multiplied, tenfold. Removed from the madding crowd, and the harassing of friends, their bodily improvement alone is proof of this beneficial system. But the colony should be larger, the acreage should be greater, and not restricted or confined to men, but for every woman capable of using a hoe or fork. The sentimental prejudice against woman's working in the fields must be reckoned with; society, and hysterical reformers, are not always the most competent to judge of what is best for the mentally afflicted; the practical asylum man usually strives for the best results, and occasionally attains them.

Instead of sweltering over the washboard or brooding over monotonous needlework, women should have broad-brimmed hats on their heads and garden hoes; they should be led into the fields and orchards to work at the thousand and one small things now done by men.

The chronic insane we shall always have with us; it is our duty to see that everyone is provided with suitable employment; so much the better if they can spend their years, long or short though they may be, amid the sweet reminders of their childhood; the perfume of the fields; the lowing herds, and waving seas of golden grain.

CLINICAL CASES V.

TRANSITORY ALIENATION FOLLOWING DISTRESSING PAIN.

By HENRY J. BERKLEY, M. D.

Persons that verge upon the borderland between sanity and insanity, and upon whom it is only necessary to lay an unusual strain to cause them to lose their mental equipoise and fall into pathological states, are always of extreme interest to the student of mental medicine. The varieties in the forms of mental disturbance exhibited at these times of collapse are usually numerous. A majority of such examples comes within the boundary lines of the so-called "periodic insanities," in which the ebb and flow of hallucination, confusion, and delusion, are often witnessed, while a portion belong to a subdivision of this class, to the insanities that commence just before or just after the appearance of the menstrual discharge.

To this latter division belongs the following case, which to me has always been of extreme interest, it being possible, at least for a time, to cut short the psychical degradation, and keep the patient in fair mental health by therapeutic measures.

Mrs. X., æt. 23, was seen for the first time in February, 1897, suffering from an intense ovarian neuralgia, more severe on the right than left side. The monthly period had begun three days previously, and on the first visit, before the administration of any drug, it was noticed that the patient was much confused mentally, even to the momentary non-recognition of persons and surroundings. On account of the extreme abdominal pain, ¼ gr. of the sulphate of morphia was administered at once, and repeated again in three hours. The same night the patient arose from her bed, walked out of a rear window upon the roof in her night clothes, and for a time neither recognized her husband nor child, though she continued to be docile when spoken to, or

when ordered to take nourishment or drink. The following morning she was clear in mind, but retained no recollection of the events of the previous night. Under the charge of a responsible nurse she passed a fairly quiet day, but in the evening again became disoriented, walked about the room in her night clothes, and was somewhat difficult to restrain. There were also some minor sense deceptions noticed.

This was the end of the mental disturbance for this period, and with the cessation of the menstrual flow and colicky pains the patient returned to health.

Family History.—On the side of the paternal grandfather nothing is known of nervous disturbance. The maternal grandmother had "weak nerves" and was of an irritable disposition. The father has "nervous spells," the nature of which could not be ascertained, and is also excitable. The mother has been in a sanitarium for "neurasthenia," but made a good recovery, and has been well for several years. A sister of the patient is delicate, has several times suffered from "nervous depression," and still continues to be "nervous," with many vague neuralgic pains.

The patient is a well-built woman, 163 cm. in height, blonde, osseous system well-developed, cranium of the sub-brachycephalic type without unusual irregularity. Palate, uvula, and teeth are perfectly formed, and the only stigma of degeneration is a large anæsthetic patch on the skin of the right groin and thigh. As a girl she was healthy and strong; she learned readily at school, and acquired a good education.

From its inception menstruation was painful, the severe discomfort lasting for the first three days, the remaining portion of the period being normal. No distinct history of any mental alienation could be determined in the first years succeeding puberty, though she admits being unwarrantably irritable at intervals of every three or four months.

Mrs. X. married in her twentieth year. A few months afterward, her husband, coming home late one evening from his business, found her wandering about her rooms with dishevelled hair, and the furniture in a state of disorder. On speaking to her, he received a reply irrelevant to the question, and on looking at her more closely he perceived that she was confused, did not recognize him, and spoke entirely at random. There was slight

motor excitement with the confusion, but from his description there were no hallucinations. The confusion and motor agitation lasted only a few hours, and by the next morning the cloud had passed. The monthly period had begun the day before.

In about three months, as well as the husband remembers, a similar scene was witnessed by him, the only difference being that the motor excitation was not as well marked. At somewhat irregular intervals, though not more than four months between any of them, the picture of mental clouding was repeated, always about the inception of the monthly period.

Toward the end of the second year after her marriage, Mrs. X. became pregnant, and was normally delivered of a male child at term. Some days after the delivery there were considerable pain and uterine tenderness, followed by obtunding of the intellect, but no severe symptoms, and she made a good recovery from the parturient period. The slight inflammation about the uterus resulted in a considerable increase in the pain at the time of the succeeding catamenia, which were not only more severe but lasted a longer time. At almost every epoch there was the recurrence of the bewilderment, which passed off within a day or two.

The attack of ovarian neuralgia in which I first saw her was the most severe she had ever had; not only was the bilateral abdominal pain intense, but after a day or two was repeated, with but slight recurrence of the mental symptoms. On this recurrence morphia was not given at all, but reliance was had upon belladonna, warm injections and applications.

The next period there was a repetition of the one preceding it, but the pain was much less severe, and the bewilderment much lighter, only lasting a few hours. Belladonna and salol had been given for some days before the expected period. A dull pain was now constantly present in the region of the right ovary which prevented walking with any comfort. The patient was sent to the mountains, where she remained until late in August, the periods passing without much disturbance, but the pain in the right iliac region continued, and prevented her from taking exercise.

On September 17, 1897, at the time for the beginning of the menses, Mrs. X. had several attacks of fainting; the first one in the early morning, the last one about six o'clock in the afternoon.

All were without convulsive movements, but the loss of consciousness was profound, and the conjunctiva could be roughly irritated without reaction. Mental confusion, lasting about half an hour, followed the fainting seizure. In the evening there was considerable abdominal pain, mainly located in the right iliac region. Later in the night she was bewildered, did not recognize her husband or child, had hallucinations of a crowd of people being around her, and of shadows moving about the room, and in the middle of the night she was prevented by her husband from walking out of a third-story window. The following day, with the exception of a few minutes after a slight fainting attack, she was perfectly clear in mind, and thereafter made a good recovery.

The October menstrual period passed with but slight psychical disturbance, though there was considerable pain.

The November period came on with agonizing pain and great mental distress. There was very considerable tenderness in both iliac regions, and but slight discharge. Local examination showed the ovaries to be much tumefied, but nothing unusual could be determined. The pain shortly assumed a colicky character, and during the access the patient became delirious and had vivid hallucinations of objects moving around her. The arteries were now contracted; the pulse irregular. Following the hallucinations came a profound bewilderment, lasting three days, partly relieved by injections of morphia, but it required a half-grain of the drug at each injection to have any influence upon the pain. The temperature was 99°, pulse 100. The return to normal mentality was after a deep sleep. Local tenderness continued to be present in the ovarian region.

An operation was now determined upon, and on the 25th of the month, both ovaries, and the Fallopian tubes, were removed. The ovaries were slightly cystic, both tubes were twisted upon themselves so as to almost obliterate the lumen, and both were somewhat congested, the degree in the right one being greater than in the left. The intestinal peritoneum was perfectly smooth. The patient made a good recovery, the incision healing without accident.

At the time of the next period, there was considerable hysterical excitement lasting for several days, but no degree of confusion.

The January period began with profound mental disturbance. For several days preceding the menses the patient experienced a deep sense of mental inhibition, thought being extremely painful. The eyes were congested, and varied anæsthesias and paræsthesias tormented her, but there was no actual melancholic depression. The pulse was crampy, slow, irregular, the heart sounds indistinct, the bowels constipated. On the third day the attack culminated in a profound lethargy, from which it was only possible to arouse her for a few seconds, and even then the replies to questions were confused or irrelevant. Whenever roused she complained of great photophobia, and the room had to be kept dark. Food was taken in sufficient quantities if placed in her mouth. Up to this time no medicine had been given. She was now ordered belladonna in sufficient quantity to dilate the pupils, and to partially relieve the vascular cramp. The improvement was only moderate, and she continued in the stuporous state for about ten days. Toward the end of the stupor, she exhibited an extreme irritability, but no actual excitement when she was aroused. The photophobia only ceased when there was a return to the normal state. This took place suddenly, at the end of the ten days, on awakening in the morning. She afterwards retained little recollection of the stuporous state, but remembered having a few hallucinations as of people walking and acting on the stage of a theatre. The arterial contraction slackened perceptibly before resolution.

The urine was, during the ten days, scanty, fairly high colored, contained an excess of phosphates, chlorides, and urea, but no sugar, albumen, or indican. After the attack was over it became much more abundant.

During the succeeding month the patient was placed on iron, asafœtida, nux vomica, and plain nourishing food, and instructed to take as much outdoor exercise as possible. On the first appearance of the mental inhibition, a few days before the time for the expected period, she was given belladonna, in quantity sufficient to induce decided constitutional effect. The vascular spasm soon relaxed, and the confusion which had succeeded the inhibition, though not to the same extent as in the previous month, departed with it. During the following four weeks the diet and ferruginous tonics were adhered to, and when

the end of the month was reached, belladonna was again administered, this time before any symptom of mental inhibition. The psychical confusion only lasted a single day, and was not marked. Similar treatment was adopted at the time for the next period, but it passed without disturbance.

During the interparoxysmal periods, the patient, on the closest examination, showed none of the stigmata of mental degeneracy. She was calm, reasonable, conversed intelligently on a variety of subjects, interested herself with her child, her music, and her household duties. With the exception of the disturbance immediately following the operation in November, 1897, there have been absolutely no hysterical manifestations, and these were probably induced by contact with another patient, nor has there ever been anything approaching an emotional state except at the time of the menstrual era.

From April, 1898, to August, 1899, Mrs. X. was entirely free from any sign of psychical disturbance. She travelled, visited among relatives, and took a full part in her home duties, and appeared to be in every way in good health.

In August last, as a direct consequence of excessive cold bathing at the seashore followed by over-exertion, she began to suffer pain in the right hypochondriac region. In the course of a few days this became intense, gradually becoming diffused over the whole of the abdomen, and in the end culminating in an uncontrollable agony. The surgeon who was called operated under the impression that the patient was suffering from appendicitis, but found the sigmoid flexure of the colon bound down by a mass of contracting adhesions, and, behind the constriction, the bowel packed with scybalous masses. The constricting bands were divided, the intestine evacuated of its contents, and the patient made a fair recovery. From the account given by the surgeon, Mrs. X. at the height of the agony was delirious, and had to be kept under the influence of morphia until the operation was performed. In the early part of October she returned to her home.

On November 24, I was again called to see her. There had been a recurrence of the abdominal pain, distention and some vomiting as the result of cathartics taken to relieve continued constipation, and anorexia. There was considerable diffused abdominal tenderness, but no elevation of the bodily temperature.

A high enema brought away a number of hard fecal masses and relieved the meteorismus. The enemata were repeated from day to day, apparently with the best results. Nevertheless, on the evening of December 3, there was a severe access of pain in the right inguinal region, apparently as the direct result of an injection. Within a half hour after its inception the patient became highly delirious, was difficult to restrain in bed, had vivid hallucinations of faces appearing upon the wall, from which she shrank in terror when they grimaced at her, was much confused, and at times did not recognize those around her, addressing them by the wrong names. In the intervals between the severe paroxysms of pain she complained of being confused and out of her head. Morphia was given by subcutaneous injection, but in barely sufficient quantity to relieve the pain. The hallucinations and confusion lasted from ten o'clock in the evening until five o'clock the next morning, when she fell asleep. By the following afternoon she had fully recovered her normal mentality.

Mrs. X.'s only child is a boy four years of age, well-developed and intelligent, but when there is some passing febricula he soon becomes delirious and unmanageable, and should the fever continue for several days (as in a mild attack of measles a year ago) there are muscular twitchings, rolling of the eye-balls, and repeated screaming fits, in which he seems to be only partly conscious.

Proceedings of Societies

MINUTES OF THE SEVENTH MEETING OF THE ASSOCIATION OF ASSISTANT PHYSICIANS OF HOSPITALS FOR THE INSANE.

The 7th meeting of the Association of Assistant Physicians of Hospitals for the Insane was held at the Cleveland State Hospital, Cleveland, Ohio, September 26, 27 and 28, 1899. The following members were present: Dr. S. F. Mellen, Long Island State Hospital, King's Park, N. Y.; Dr. W. A. Searl, Fairoaks, Cuyahoga Falls, Ohio; Dr. E. L. Emrich, Maplewood Sanitarium, Wooster, Ohio; Drs. C. B. Chapin and Irwin H. Neff, Eastern Michigan Asylum, Pontiac, Mich.; Drs. Louis J. Goux and W. G. Hutchinson, Detroit, Mich.; Drs. Herman Ostrander and Arthur McGugan, Michigan Asylum for Insane, Kalamazoo, Mich.; Dr. A. F. Shepherd, Toledo State Hospital, Toledo, Ohio; Drs. James F. Kelly, Willis S. Hobson and Fannie C. Hutchins, Cleveland State Hospital, Cleveland, Ohio; Dr. A. E. Sherman, Winnebago State Asylum, Winnebago, Wis.; Dr. Charles H. Clark, Massillon State Hospital, Massillon, Ohio; Dr. Robert E. Ruedy and Dr. George Stockton, Columbus State Hospital, Columbus, Ohio; Dr. Edwin M. Huston, Dayton State Hospital, Dayton, Ohio; Dr. F. H. Jenks, Illinois Northern Hospital for Insane, Elgin, Ill.; Dr. Harriet B. Conant, Yankton State Hospital, Yankton, S. D.; J. W. Slaughter, Ann Arbor, Mich.

The following guests were present: Dr. H. J. Spence, Cleveland, Ohio; Dr. I. A. Bradley, Akron, Ohio, and others.

First Session, September 26, 3 p. m. The President, Dr. E. L. Emrich, Maplewood Sanitarium, Wooster, Ohio, presided. The minutes of the 6th meeting of the Association of Assistant Physicians of Hospitals for the Insane, held at the Illinois Eastern Hospital, Kankakee, Ill., September 28-29, 1898, were read and adopted, as printed in the American Journal of Insanity, for January, 1899.

The Executive Committee recommended the following persons for election to active membership; elected: J. W. Slaughter, Ann Arbor, Mich.; Dr. Will MacLake, Eastern Michigan Asylum, Pontiac, Mich.; Drs. James F. Kelly, Fannie C. Hutchins and Willis S. Hobson, Cleveland State Hospital, Cleveland, Ohio; Drs. Charles H. Clark and C. B. Rogers, Massillon State Hospital, Massillon, Ohio; Dr. Richard O'Connell, Ohio Home for Epileptics, Gallipolis, Ohio; Drs. Robert E. Ruedy and George Stockton, Columbus State Hospital, Columbus, Ohio; Dr. Henry E. Perry, Upper Peninsula Asylum, Newberry, Mich.; Dr. Fred L. Pettijohn, Central Indiana Hospital for the Insane, Indianapolis, Ind.; Dr. Edwin M. Huston, Dayton State Hospital, Dayton, Ohio; Dr. A. F. Shepherd, Toledo State Hospital, Toledo, Ohio.

The following resignations were accepted: Dr. William L. Russell, Willard State Hospital, Willard, N. Y.; Dr. C. A. Drew, Medfield, Mass.; Dr. Ella V. Timmerman, Elgin, Ill.; Dr. C. R. Sheffer, Dunning Hospital for the Insane, Dunning, Ill.

The Secretary then made the following report:

In accordance with a resolution adopted at the last meeting of the Association, letters were sent to the superintendents of the institutions represented on the membership roll, requesting that they endeavor to have delegates appointed by their respective hospitals. I am pleased to say that all the answers indicated a willingness to co-operate in securing this end, and it is possible that at this meeting we have begun to reap the benefits.

I would suggest the adoption of a plan for systematic work. Such a scheme was elaborated by Dr. Phelps at the fourth meeting of the Association, Dec. 3, 1896, and referred to a committee. It has not been practicable for the committee to make the report, and it would seem wise to discharge the committee, and reopen the subject for general discussion. It will be noticed on the programme that a subject for general discussion is mentioned. This is in the nature of an experiment, but it is hoped that it will prove acceptable, and that some such plan may become a fixture.

I would also recommend for consideration a change in the constitution, regarding active membership. We have on our roll several members who are engaged more or less directly in asylum work, but who are not assistant physicians. Again we have members who were formerly assistant physicians, who have retired, and wish to be retained on the active membership roll. Therefore it might be feasible to change or modify article 3 of the constitution.

I would also call attention to the extreme difficulty which the secretary has of keeping track of some delinquent members. Although changes in the medical staff frequently occur, and are unavoidable, it is certainly

possible for members to keep the secretary informed of their residence. It might be wise to have an understanding that arrears for membership dues for two years is sufficient to forfeit active membership in the Association.

After discussion of the topics mentioned, Dr. Ruedy made the following motion: "That the President appoint a committee of three to consider and report upon the suggestions made by the Secretary." Carried. The President thereupon appointed the following committee: Drs. Searl, Ostrander and Ruedy.

The report of the Treasurer was read and accepted.

The following officers were elected for the ensuing year: Vice-President, Dr. H. R. Niles, Oak Grove Hospital, Flint, Mich.; Secretary and Treasurer, Dr. Irwin H. Neff, Eastern Michigan Asylum, Pontiac, Mich.; members of Executive Committee (in addition to those mentioned above), Dr. W. A. Searl, Fairoaks, Cuyahoga Falls, Ohio, and Dr. E. L. Emrich, Maplewood Sanitarium, Wooster, Ohio. Adjournment 3:45.

SECOND SESSION, September 26, 7:45 p. m. Dr. Henry C. Eyman, Superintendent of Cleveland State Hospital, addressed the Association as follows:

Buckeyes are never so happy as when welcoming strangers within their gates, and entertaining them within the portals of their homes. We intend to spare no pains to make your visit a pleasant one. I want my assistants to extend to you all the right of fellowship. I have a very warm place in my heart for the assistant physician. For seven years I had the honor and pleasure of performing the duties assigned to the assistant physician. I enjoyed the work, and assure you that the responsibilities of the superintendent are most onerous when compared with the pleasant duties of an assistant. Some of my assistants think it unfortunate that I should have walked the path they are now treading, as the thorns and briers and stony places are too well known, and consequently they think I do not appreciate their efforts to the fullest extent. This is a mistake, for I freely confess that it is your skill and kindness which help make life bearable to those suffering from the darkness of affliction.

Thank God, the sun of righteousness and humane intelligence has broken in and has driven out ignorance, superstition, sin, and despair. The guard who formerly watched his patient in confinement has given way to the educated, trained nurse, and the hospital ward; and to the assistant physician more than all else is due this remarkable change in the environment of the most unfortunate of God's creatures. When Pinel struck the chains and shackles from the insane in 1792, he did more than liberate a diseased brother; he planted a knife deep in the heart of tyranny and brutality and destroyed the power of ignorance, superstition, bigotry,

and inhumanity, which till then had held the world in bondage. The liberation of the human intellect was of infinitely greater consequence than the relief of a few distressed, mindless brothers. And the work begun by the great Pinel has been successfully carried on by his humble followers to the present day. It is to you, the assistant physicians of our hospitals for the insane, that we must look for a constant, steady, upward growth, and a broadening of the human intellect, until the pathological entity which produces manifestations called insanity be held firmly in the grasp of science.

I again welcome you to this hospital, and hope your stay with us may be pleasant and profitable. To you are entrusted the lives and happiness of many people.

"The sweetest blessings, falling from above,
Are human sympathy and human love."

One strengthens hope by stimulating cheer; the other softens sorrow with its tears, and together they form the golden rim that spans the borders of eternity.

Dr. Henry C. Eyman was recommended and elected to honorary membership.

The President invited visitors to participate in dicussions.

Dr. James F. Kelly, of the Cleveland State Hospital, read a paper on "Disorders of Sleep among the Insane." Discussion: Drs. Mellen, Huston, Neff, Clark, Hutchins, Shepherd, Chapin, Ostrander, Eyman, and Emrich.

Dr. Herman Ostrander, of the Michigan Asylum for the Insane, read a paper on "The Colony System of Caring for the Insane." (See AMERICAN JOURNAL OF INSANITY for January, 1900.) After a short discussion further consideration of the paper was postponed until the following session. Adjournment 9 p. m., to attend a reception and banquet given by Dr. Eyman to members and guests of the Association.

THIRD SESSION, September 27, 9:45 a. m. The discussion of Dr. Ostrander's paper was resumed. Discussion by Drs. Kelly, Mellen, Emrich, and Huston.

J. W. Slaughter, Ann Arbor, Mich., read a paper on "Disturbances of Apperception in Insanity." Discussion: Drs. Ruedy, Hutchinson, Mellen, and Huston.

Dr. Charles H. Clark, Massillon State Hospital, read a paper on "Treatment of Insanity." Discussion: Drs. Searl, Mellen, Kelly, Hutchinson, Ruedy, Emrich, Ostrander, McGugan, and Eyman.

Dr. E. L. Emrich, Maplewood Sanitarium, Wooster, Ohio, read a paper on "Suicides." Discussion: Drs. Ruedy, Neff, Slaughter, Eyman, Huston, and Conant.

Dr. Louis J. Goux, Detroit, Mich., read a paper on "The Importance of Ophthalmological Work in the Insane." Discussion: Drs. Kelly, Spence, Ruedy, Neff, and McGugan. Adjournment 12:10.

FOURTH SESSION, September 27, 3:45 p. m. Dr. Herman Ostrander extended an invitation from Dr. William M. Edwards, Superintendent of the Michigan Asylum for the Insane, Kalamazoo, Mich., to hold the next meeting at that institution. Dr. Irwin H. Neff extended an invitation from Dr. E. A. Christian, superintendent of the Eastern Michigan Asylum, Pontiac, Mich., to hold the next meeting at that institution.

Dr. Irwin H. Neff read a paper on "A Case of Multiple Cerebro-spinal Sclerosis of a Special Anatomical Form, with a History of Pronounced Family Defect," by Dr. Neff and Dr. Theophil Klingmann. Discussion: Drs. Ruedy and Kelly.

Dr. F. H. Jenks, Illinois Northern Hospital, Elgin, read a paper on "Differential Count of White Blood-corpuscles in a Few Cases of Paretic Dementia." Discussion: Drs. Neff, Chapin, and Emrich.

Dr. C. B. Chapin read a paper by Dr. Jason Morse, Eastern Michigan Asylum, on "Goiters in Insanity." Discussion: Drs. McGugan, Neff, Emrich, Chapin, Searl, and Jenks. Adjournment 5:15 p. m.

FIFTH SESSION, September 28, 9:20 a. m. Dr. W. A. Searl, chairman of the committee appointed by the President to report on suggestions made in the Secretary's report, made the following report:

1st. Your committee recommends that this Association be guided by the outline of work suggested by Dr. R. M. Phelps at the meeting held in Independence, Iowa, and published in the AMERICAN JOURNAL OF INSANITY, of January, 1897.

2nd. That at the next meeting of this association three papers on each of the following subjects be written: (1) Classification, (2) Pathology, Anthropology and Bacteriology, (3) Clinical Studies, (4) Topics of General or Special Interest.

3rd. That members of the executive committee be appointed as corresponding secretaries, to solicit papers under each topic, and to arrange

for two persons to discuss each paper, these discussions not to preclude voluntary discussions.

Your committee further recommends the following: That article 3 of the constitution be changed to read as follows: "Any assistant physician, medical officer, pathologist, or psychologist, associated with a hospital for the insane, shall be eligible to active membership."

That in section 3 of the by-laws the word "physician" be changed to "person."

That to the by-laws be added section 11, which shall read as follows: "Any member who is in arrears for dues for two years shall forfeit his membership."

It was moved and carried that the report of the committee be voted upon in sections. The propositions were accordingly taken up separately, and adopted.

Dr. Robert E. Ruedy, Columbus State Hospital, read a paper on "Haematoporphyrinuria, With Report of a Case Following Prolonged Use of Trional." (See AMERICAN JOURNAL OF INSANITY for October, 1899.) Discussion: Drs. Neff, Kelly and Searl.

Dr. Herman Ostrander read a paper by Dr. Adolf Meyer on "The Meaning and Purpose of the Classification of Diseases Used in the Last Report of the Worcester Insane Hospital." Owing to the lateness of the hour discussion of Dr. Meyer's paper was postponed until the following session. Adjournment 11:10 a. m.

SIXTH SESSION, September 28, 1:30 p. m. Dr. Meyer's paper, which was read during the morning session, was taken up and discussed by Drs. Neff and Ostrander.

Owing to limitation of time the paper of Dr. Irwin H. Neff, Eastern Michigan Asylum, on "Pupillary Disorders in the Insane" was read by title.

The general discussion of "Methods of Diagnosis of Insanity" was omitted.

In the intervals between the sessions visits were made to the different parts of the institution. The time and place of the next meeting was left to the decision of the Executive Committee.

Upon motion of Dr. Jenks, the thanks of the Association were extended to the superintendent and staff of the Cleveland State Hospital. Adjournment.

IRWIN H. NEFF, Secretary.

THE QUEBEC MEDICO-PSYCHOLOGICAL SOCIETY.

Meeting of October 26, 1899, held in the St. Jean de Dieu Insane Asylum, Longue-Pointe. Dr. Burgess presided.

The minutes of the previous meeting were read and accepted.

Letters of thanks were read from DRS. GUERIN and URQUHART, who had been elected honorary members.

A letter from the Hon. Secretary of the Province, informing the Society of the adoption by the Government of the medical certificates prepared by the Society for the admission of the insane, was presented.

M. VILLERS donated to the Society the following work: "Le délire de la jalousie."

DR. CHAGNON gave notice that, at the next meeting, he would move that a special committee be appointed, whose duty it should be to elaborate a uniform plan for classifying mental disease, and for preparing uniform tables of statistics, for the various asylums of the Province.

DR. CHAGNON took up again the question of uniting the doctors of the asylums of the Dominion of Canada into a society to be affiliated with the Medico-Psychological Society of Great Britain and Ireland.

DR. VILLENEUVE suggested that the president and secretary enter into communication with the physicians of the Canadian asylums with a view to an understanding on this subject, which was agreed to by the Society.

COMMUNICATIONS.

TWO CASES OF EPHEMERAL MANIA UNCOMPLICATED WITH EPILEPSY, INTEMPERANCE OR PARTURITION.

BY DR. BURGESS.

My contribution, gentlemen, hardly deserves the name of a paper, being merely the record of two cases of a form of mental disorder, which, in my experience, has been rare. So much so, in fact, that they constitute the only cases of this exact type that I have encountered during twenty-five years of attendance upon the insane. Singularly enough, too, they occurred within a fortnight of each other, in the summer of 1897.

The cases to which I allude would fall under the class of mania styled, by Dr. Clouston, ephemeral mania, or *mania transitoria*, and defined by him as a somewhat rare form of mental exaltation, coming on suddenly; usually sharp in its character; accompanied by incoherence, partial or complete unconsciousness of familiar surroundings, and sleeplessness; and lasting from an hour up to a few days.

Of the two terms used by Dr. Clouston, I consider the term ephemeral mania decidedly preferable, because *mania transitoria* is sometimes used as a synonym for transitory frenzy (*furor transitorius*), more rarely, for acute delirious mania; from both of which disorders, ephemeral mania is distinct, lacking the blind desire of destruction characteristic of the former and the typhoid symptoms peculiar to the latter.

While attacks of transient insanity in connection with epilepsy in some of its forms, childbirth and the use of alcohol, are by no means rare, the cases to which I would call attention had their origin in none of these conditions, and may therefore prove of some interest. They were practically cases of ordinary acute mania distinguished by and peculiar only by reason of their extremely short duration, a fact which, under certain conditions, might become of paramount importance in a medico-legal aspect.

Case I. J. S., a married woman aged forty, was admitted to Verdun Hospital on July 18, 1897. The history as furnished was that she had been a passenger from St. Johns, Newfoundland, to Owen Sound, Ontario, whither she was proceeding to join her husband who had left the Island some months previously, and had arrived in Montreal, *en route*, during the morning of the day on which she was placed under my care. On reaching the city, where she had some hours to wait for a connecting train, she had asked the station-master where she could get some breakfast, and had been directed by him to a respectable restaurant near by. There was at this time, so far as I can ascertain, nothing peculiar about her in either appearance, manner or conversation. On entering the restaurant, she was asked by the proprietor if she would not remove her bonnet and shawl while eating. This seemed to frighten her, and leaving hurriedly, she wandered aimlessly about the streets for several hours. About 2 p. m., she reached Westmount, one of the

suburbs of the city, and stopping at a private residence there asked for a drink of water, coupling the request with one to be allowed to sit down and rest. Having been given a drink and some luncheon by the lady of the house, to whom she told her story quite coherently, she asked her newly-made friend if she could suggest a stopping-place where she might remain until her train should leave. A charitable institution, St. George's Home, was suggested, and arrangements made for her conveyance thither. The matron of the home, who welcomed her and at once set about making her comfortable, stated that she was extremely nervous and fidgety, but otherwise seemed perfectly well. About 6 o'clock, she suddenly jumped from a sofa on which she had been lying, and with a piercing scream sprang toward a window and endeavored to throw herself therefrom, but was prevented by the matron who chanced to be standing by. This action was followed by undoubted signs of insanity, and she soon became so noisy and excited that the police were notified. She was taken to the police-station in a raving condition, screaming incoherently at the top of her voice, and there it was found necessary to put her in a strait-jacket to prevent her doing herself bodily harm. I was communicated with by telephone, and she was brought to the hospital, about midnight, in charge of three policemen.

I found her to be a stout, well-nourished woman, with a wild, hunted look, who kept up a constant babble of incoherent talk, and from whom it was impossible to gain the slightest information concerning herself. Her pulse and temperature were normal. She was at once put to bed and left in charge of two nurses, but no sedative was given inasmuch as I had been told by one of the policemen that their surgeon had given her a sleeping-draught of some kind just before they left the station. She dozed at intervals during the night, but was noisy most of the time, throwing herself about on the bed, and trying to slap and scratch the nurses in charge of her. In the morning she was given a hot bath, and was much quieter, though sleepless, for some hours after. She took but little nourishment, being seemingly afraid to drink the milk offered her, but ate a soda biscuit. Gradually the condition of excitement returned, and there was an incessant incoherent chatter with constant efforts

to get out of bed. She finally became so restless, and made such persistent efforts to injure herself, pulling her hair and trying to strike her head against the wall, that, about 3 p. m., I gave her 1/75 of a grain of hyoscine hydrobromate, hypodermically. Very soon after its administration she fell asleep and slept until 9 p. m., when she awoke much quieter though still restless, apparently frightened, and incapable of coherent conversation. This condition continued during the night and until the arrival of her husband, who had been telegraphed for, about 8 a. m. She was delighted to see him, and at once lost much of her frightened look and manner; talked quite rationally to him, ate a hearty breakfast, and soon after got up, dressed herself, and went for a walk around the grounds with him.

In the course of a long conversation with her, I could detect not the slightest sign of any mental obliquity remaining, but found her apparently completely rational; the entire duration of the insanity, dated from the time of her quitting the restaurant, having been less than forty-eight hours. She told me she did not know what had brought on the attack, of which she had never had one before, except that for some reason, she herself could not tell what, she felt frightened at the people where she had gone for breakfast. She had a vague recollection of what she had done between the time of leaving the restaurant and her arrival at St. George's Home, but none whatever of anything that had happened between the moment of her outbreak there and that morning, when she could recall seeing the nurses sitting by her bedside, and wondered where she was. She left for her home at Owen Sound on the afternoon of the same day, and over a year later, my last account of her, had had no recurrence.

By the closest questioning of the husband I could glean no evidence of any epileptic condition, masked or otherwise, nor history of heredity other than that a maternal aunt had died insane. Her habits of life had always been of the best, and she had never displayed any tendency to hysteria or other neurotic disorder; on the contrary, she had always been looked upon as a particularly healthy, strong-minded woman.

As regards causation, I can but suppose that the excitement of travel to one totally unaccustomed thereto (she had never been on a railway-train before), combined with the fatigue incident

to such a long journey had been sufficient to upset her mental equilibrium.

CASE II. I was called in consultation by a brother practitioner to see a young girl, M. T., aged nineteen. She had gone out walking in the morning, and while crossing the street had been nearly run over by a street-car, but had received no injury, and had continued her promenade, doing some shopping, and had returned home apparently as well as when she had started out. About three hours after, while chatting quietly to one of her sisters, she suddenly became incoherent in speech, began to walk restlessly about the room, played the piano violently, mixing up snatches of airs in the most incongruous manner possible, and used very profane language. When put to bed, she talked and rolled about, shouting and singing at the top of her voice. Her friends in vain tried to soothe her but she did not recognize any of them, and her incessant conversation was a jargon of fleeting, disconnected delusions.

When seen by me in the evening, about six hours after the commencement of the attack, I found her to be a stout, well-nourished girl, with what in health must have been a pleasant and intelligent countenance. The pulse was very slightly accelerated, but the temperature was normal, and the tongue clean. She had a wildly excited appearance, refused food and medicine, and was very restless, endeavoring to pull off her night-dress, rolling about the bed, and constantly trying to get up, but not at all inclined to be violent. She kept up a loud, continual, incoherent chatter, repeating over and over again in a meaningless way anything said by those about her. At times, from her actions there were evidently both visual and auditory hallucinations of a terrifying character. The patient had enjoyed the best of health up to date, with great fondness for outdoor sports and exercise. No similar attacks had ever occurred, and the most minute inquiry could elicit no evidence of epileptiform seizures of any kind. Her habits of life had been good, and there had been no tendency to hysteria or other neurotic disease of any kind. There was, however, a strong hereditary predisposition to insanity, her maternal grandmother having had two attacks of melancholia, while an aunt, also on the mother's side, had been an inmate of an asylum for some years. No exciting cause other than the fright she had had could be imagined.

After advising the application of cold to the head, and the administration of a hypodermic of 1/100 of a grain of hyoscine hydrobromate, I left, promising to send the necessary papers for her admission to the hospital as soon as possible. This I did, but was astonished to receive, about noon the next day, a telephonic message from my confrère that he trusted there would be no need to use them as the patient was seemingly quite recovered. On receiving the hypodermic, about 9 p. m., she had quieted down and slept from ten to two. She then awoke, and though still restless and talkative, was decidedly less so than when she had fallen asleep. She recognized those about her, and wondered at the presence of a stranger, her nurse. After partaking of a bowl of bread and milk she fell asleep again, and remained so up to 7 a. m. On again awaking, some slight confusion of intellect with motor restlessness was still apparent, but this gradually passed off, and by noon, as already stated, she was quite well again, nor has there since been any recurrence.

The total duration of the attack in this case was only about twenty-two hours, namely, from 2 p. m. of the one day to midday following. Here, too, there was no recollection of anything that had occurred from the time of the seizure up to near the period of complete recovery, while the causative agency could only be ascribed to the shock of a sudden fright acting upon a strongly neurotic diathesis.

Discussion.

Dr. Chagnon:—I will allow myself the privilege of adding the following observation to the very interesting cases which Dr. Burgess has just reported to us.

C., 17 years old, is a baggagemaster with one of our railroad companies. His father died of liver disease at the age of 52. His mother and sister are in good health. Two uncles died of tuberculosis. In infancy he suffered from measles and diphtheria.

About December 25, 1895, he began to complain of loss of appetite, constipation and insomnia. He manifested, besides, a slight febrile reaction, and, some days later, he complained of cephalalgia. He then gave up all work. . . . January 24, 1896, he began to show signs of mental trouble, which developed rap-

idly into a maniacal state. Coming under my medical care in the St. Jean de Dieu Asylum, January 30, he manifested absolute incoherency, inexhaustible talkativeness, disordered muscular movements and complete insomnia. Upon Feb. 5 he awoke quite sound of mind. It should be mentioned here that we had been obliged, from the very beginning, to combat a stubborn constipation, which gave us much trouble to overcome.

He was admitted a second time May 24, 1898. The disease had made its appearance two days previous to his entrance, after a day and night of hard work. Eight days later he was cured of this attack of mania.

On the ninth of the following month he took part in a religious procession, during the course of which he was exposed to a burning sun for more than an hour. The same evening he complained of cephalalgia, and on the following day he showed semisomnolency and refused all food; the next following day he became a raving maniac. The duration of this attack was fifteen days.

July 8, after another long exposure to the sun, in a game of foot-ball, he had another relapse which lasted only for a few days.

August 1, following a three days' attack of fetid diarrhoea, he manifested another attack of mania; he was very well on the 10th and left the asylum on the 25th.

After two days spent with his family, he was again admitted with symptoms of subacute mania. September 1 he was perfectly restored and October 6 left the asylum.

Therefore, our patient has had six (6) attacks of mania which were perfectly distinct one from the other and of variable intensity. The maximum duration of each attack was fifteen days. If we take into consideration the pathological condition of the digestive functions at every attack, it is not difficult to attribute a large portion to auto-intoxication, even the relapses which were ascribed to exposure to the sun.

DR. VILLENEUVE:—I think I can add to these observations the case of a woman whom we observed at the St. Jean de Dieu Asylum, who, at intervals of several years, in 1885, 1894 and 1899, had three very acute maniacal attacks, which sprang up suddenly, without any apparent or appreciable cause, and lasted not more than eight days on an average. It was hereditary in her case; one of her brothers had been insane.

The cases which have just been reported by Dr. Burgess clearly show the characteristics which Vallon, in his report to the congress of French alienists and neurologists, in 1898, attributes to ephemeral mania, namely, attacks appearing abruptly, reaching their climax very rapidly, and, likewise, ending in a sudden manner by a return to the condition *quo ante*. The other cases could be more properly called attacks of acute mania of short duration.

The observations reported by Dr. Burgess are remarkable from the fact that the attack of transitory mania that one of his patients presented cannot be traced to any pre-existing pathological condition. This fact would come in conflict with the opinion of almost the entire body of French alienists, and which was confirmed by a unanimous vote taken at their Congress in 1898, to wit, that transitory mania is always symptomatic.

Several observations of this kind might reopen the question which the French Congress settled by its vote: "Does there exist a form of transitory idiopathic insanity? As for me, during my experience as an alienist and medical expert, for five years, in the largest asylum in the largest city of Canada, I have never met a case of transitory mania which I was not able to trace back to some pathological condition.

DR. BURGESS:—From the cases which I have observed and reported, I am inclined to believe in the existence of transitory idiopathic insanity.

TWO CASES OF AUDITORY PERIPHERIC HALLUCINATIONS.

DR. CHAGNON:—I have observed at the St. Jean de Dieu Asylum two men afflicted with hallucinations of the sense of hearing, who, I think, may prove interesting on account of the causes which excited in them these hallucinations.

OBS. I. G. is thirty-two years old; a laborer. His father died of "dropsy." Besides this, there is nothing worthy of note in his family's pathological history.

During his entire life he has been afflicted with "*aboulia*." For example, he was married, he declares, at twenty-five years of age, very much against his will. At every visit he paid the woman whom he was courting, he resolved to refuse to accept

the offer of marriage "*which she made him;*" but each time he was unable to find the necessary will-power to reject her suit. At the foot of the altar he cherished the hope of being able to say no; but in vain, for in the presence of the priest he said "*Yes.*"

One day, being in need of gloves, he decided to devote seventy-five (75) cents towards their purchase. The storekeeper to whom he applied showed him a pair which sold at the high price of four dollars; he bought them, again unwillingly.

Up to the time of his entering the asylum his life was thus replete with actions stamped with *aboulia*.

Admitted into the St. Jean de Dieu Asylum September 8, 1898, G. manifested hallucinations of the sense of hearing only when he heard a noise of any kind, or a sound, or when he experienced an impression through the sense of touch. If he was resting, and his companions were walking in his neighborhood, he immediately heard voices apparently coming from their feet; and if he himself got up and walked, voices in like manner seemed to issue from his own. In fact, voices seemed to proceed from everybody's feet when they came in contact with the ground whether they walked softly or noisily.

The noise of water poured into a glass caused an hallucination. If I rumpled a paper, the act said to him "You are a —— fool." If I struck the iron armature of an inkstand with my pencil, there came to him in a metallic voice "You are a simpleton;" if he scratched himself, he felt a sensation that awakened the voices.

Obs. II. M., twenty-six years old; unmarried; a farmer; admitted to the Asylum May 25, 1899.

His maternal grandmother and granduncle died demented. One of his uncles is a victim of alcohol.

M. shows but slight intelligence. As in the case of G., his hallucinations of the faculty of hearing are only produced by noises or sounds. They are produced whenever his companions or he himself begin to walk.

There is, however, this distinction which he makes, that whilst the voices that reach him from his own boots speak to him musically, those from others are discordant.

The man who is the subject of the first observation, returned to his home cured in December of the same year, after a three months' treatment in the Asylum.

He has been seen again since that time. He has his pockets stuffed with medicinal powders and bottles of medicine. He has developed into a hypochondriac.

The other patient has also just been discharged from the Asylum, slightly improved.

What I would point out particularly in these two cases, each of whom presents a pathological past, is that it is absolutely necessary for them first to have an impression either upon the sense of hearing or of touch in order to experience auditory hallucinations. No noises, no voices. If everything is quiet, they have no hallucination whatever.

Medico-Legal Cases.

Dr. Villeneuve:—I beg to present the following cases to the society:

Offense against morals: allegations of irresponsibility on account of insanity and epilepsy set as a defense disproved by medical examination: condemnation.

Last May I received instructions from the police magistrate to make an examination of the mental condition of H. C., confectioner, a Belgian by birth, accused of having publicly offered for sale a box containing three pictures tending to corrupt morals. This offense comes under Article 179 of the Criminal Code, which renders the guilty party liable to two years' imprisonment. These pictures were made of colored candy and represented a naked woman and a naked man, with a dog. A picture of the Infant Jesus, carrying a cross, was pasted on the box. The trial disclosed the circumstances under which the offense had been committed. The defendant had brought this box to a hotel-keeper, telling him to deliver it to a man named S., who lived in the house, and to claim the sum of twenty-five cents, the price agreed upon for the box, and that he himself would come afterwards to collect it. The hotel-keeper opened the box, which was not wrapped up. On seeing its contents, whose intentional obscene character was only too apparent, he caused a police official to be called, to whom he gave a description of H. C. This officer went to his residence and entered into a conversation with him, under the pretence of procuring a similar box for himself. H. C.

hesitated at first, alleging that this kind of business was very dangerous in this country on account of the severity of the laws; that it was not the same in his country, where he had only to make similar boxes to make money for himself when he needed any. He finally consented to make the same kind of a box for a stipulated price. Thereupon, the officer placed him under arrest and brought him before the magistrate. H. C. was identified by the hotel-keeper as the individual who had delivered the box to him. At the trial H. C. pretended that he remembered nothing and protested his innocence. His brother asserted that some of the family had been insane and that the defendant himself was not always in his proper senses. His wife stated that he had sometimes lost consciousness, and attributed the offense of which her husband was accused to epilepsy. In view of these allegations, the defendant was, at the request of the Belgian Consul, granted a medical examination.

In the present case we have, then, to ask ourselves the following questions:

1. Could the defendant, in a general way, be considered insane?

2. Was he afflicted with epilepsy? and, if, so, was it under the influence of this nervous disorder that he had committed the act for which he was called to account?

We have sought the answer to this two-fold question in a personal examination of the accused and in a study of his history and hereditary antecedents. We obtained the latter from the accused himself and from his brother; and although it was impossible for us to test the genuineness of the latter's information on account of his living at a great distance, still we think that his statements may be held to be true.

H. C. had been living in this country for three years; he is a fancy pastry-maker by occupation, forty-two years of age, twenty years married, and the father of two children, aged respectively 10 and 17 years. His father, an army officer, was a hard drinker and died suddenly. His mother died of pulmonary phthisis. One of his sisters has been an inmate of an asylum for fourteen years. She became insane in consequence of family troubles. Another sister is of a highly nervous temperament. She has had some nervous attacks, the nature of which it is impossible to determine with precision for lack of sufficient details. The

brother whom we saw is perfectly sound, intelligent and enjoys an excellent reputation. H. C. has irregular features, is of medium height, and not over vigorous. He does not indulge in strong drinks immoderately. H. C. presents nothing out of the ordinary in his appearance and his bearing, but his countenance was visibly embarrassed when he appeared in our presence. His conversation is coherent and rational; he understands the meaning of all the questions and answers them correctly. His memory is generally good. The exactness of the informations communicated by him with regard to his family and himself was corroborated by the narrative which his wife and his brother subsequently gave us. He declared most earnestly that he was not accountable. He seemed to understand the benefit to be derived from his hereditary antecedents, of his having at times lost consciousness, and he showed forth the importance thereof with a certain cleverness. In the course of the visits which we paid him in the Montreal jail, we discovered in him neither excitement nor depression, neither delusions nor hallucinations; in a word, no mental disorder whatsoever and it does not appear from the examination to which we subjected him that he ever had any.

In our presence H. C. maintained the same attitude that he took before the tribunal, that is to say, that he remembered nothing. But it was comparatively easy, by the questions put unawares in the course of the examination, with regard to the various phases of the offense, to obtain from him answers which, put together, made a narrative in every respect agreeing with all the facts related at the preliminary examination. He even acknowledged to us that he had made the box at the request of S., and that it was not the first he had made for him. We may, consequently, affirm that the amnesia of H. C. was feigned. Our inquiries on the subject of his insanity have thus ended in the negative. We discovered in H. C. no symptoms which could warrant us in admitting that he was afflicted with insanity. His intelligence is sufficiently developed and is in no wise perverted. I questioned his wife and his brother: they reported of him no act nor sign of insanity. His wife said that his manner of living had been regular, and his sexual life normal. His brother asserted that he was obstinate, vain and proud. These, however,

are anomalies of character rather than symptoms of lunacy. In answer, therefore, to the first question, we may assert that H. C. cannot be considered a lunatic; that he is sufficiently intelligent to appreciate the nature of his acts, and that he is in the free exercise of his will.

It remains for us now to elucidate the question which refers to epilepsy.

In order that a person may be declared unaccountable on the plea of epilepsy, it seems to us that it ought to be proved: 1, That he is afflicted with epilepsy. 2, That the criminal act bears a direct relation with a fit of epilepsy, under whatsoever one of its forms. 3, That the act shows the characteristics which accompany epileptic phenomena. 4, That epilepsy has impressed on the intelligence or character permanent modifications.

During his detention, over one month, H. C. had no nervous attack. Previous to that time the information is limited to three vague facts, the details of which are completely wanting. Once he fell, whilst going down stairs, with a lamp in his hand. Another time his wife found him in his shop, stretched on the ground, apparently sleeping; and the third time, he was carried to the house by persons who informed his wife that they had picked him up from the ground just as he had lost consciousness. Never, during his twenty years of married life, had his wife remarked in him any convulsive phenomenon, nor anything approaching vertigo or absent-mindedness. Nor had she noticed anything which would indicate that he had suffered from nocturnal epilepsy. Even admitting as real his having lost consciousness sometimes, still we are not permitted to assert, in the absence of details about the phenomena which accompanied them, that they were of an epileptic nature. Three facts of an indefinite nature, occurring during the life of a man forty-two years of age may, at the utmost, allow an interrogation-point to be placed, but they do not authorize us in any wise to admit that H. C. was troubled with epilepsy. On the day the crime was committed his wife remarked nothing in him which was not customary.

In the absence of proof of the existence and reality of the disease, we may look further to find out if the act has the characteristics of an epileptic phenomenon.

The principal manifestations of epilepsy, no matter what may be its nature, are characterized by their suddenness, the unconsciousness that accompanies and the amnesia that follows them. "They are acts, abrupt, sudden and unpremeditated, performed without motive, whose author is not conscious of and of which he retains no remembrance or at least only a very confused one." (Vallon.)

A study of the circumstance under which the act was committed enables us to affirm, by the absence of these characteristics, that it cannot be a question here of an act which can be traced to an epileptic nervous disorder. We find, in fact, a premeditated act, performed for profit, with all the appearances of lucidity, with an idea even of its gravity and the recollection of which, in spite of the denials, has been retained. It was also only the repetition of identical acts having the same motive, namely, exploiting of the lewdness of others for pecuniary gain. This business was known by the brother who had sought to dissuade him from it. "I told him that it would end with his being caught," he let slip in our presence.

Then even if it could be presumed that H. C. is an epileptic, the act which he committed has not the characteristics of an epileptic phenomenon and cannot, consequently, be attributed to that nervous disorder.

The defendant appealed to his heredity. The brother whom we have seen is a perfectly sound man. The defendant seems to differ from him only in some anomalies of character and in his moral disposition. It seems, therefore, that the hereditary influence cannot be called into account in this case, only theoretically, in favor of a modification of his responsibility, insanity and epilepsy having been entirely laid aside.

Conclusions.—1. H. C. is not a lunatic. 2. The crime of which he stands accused is not a pathological act born of an irresistible impulse or disease, nor was it inspired by insane motives. It reveals such motives as are to be found among the ordinary factors in the causation of criminal acts, namely, inordinate desire for gain.

II.

MERE MENTAL WEAKNESS ASSOCIATED WITH AN ENTIRE ABSENCE OF MORAL SENSE; TWO PREVIOUS CONVICTIONS FOLLOWED BY IMPRISONMENT IN THE JAIL AND IN THE PENITENTIARY; ANOTHER ARREST WITH MEDICAL EXAMINATION AND SUBSEQUENT COMMITMENT TO A LUNATIC ASYLUM.

E. L. was brought before the police court accused of having stolen a certain sum of money from his employer. When questioned, he acknowledged having appropriated this sum, but, by way of justification, he alleged reasons which the judge was unable to recognize as emanating from a sound mind. The magistrate ordered, therefore, an examination to be made of his mental condition, which was entrusted to me. E. L. had already a criminal record and had received several different sentences as follows: October 5, 1888, reform school, five (5) years for robbery; May 25, 1894, six (6) months in jail, for robbery; August 4, 1896, penitentiary three (3) years for burglary.

E. L. is of medium height, well formed and vigorous. With the exception of the uncommon size of his ear-lobes, he presents no very striking deformity. He cannot read or write, but can calculate a little. His memory has acquired a certain degree of development; he gave information about his life, not very full, it is true—for he is not prolix—but exact, nevertheless. However, it was only after several interviews that I was able to obtain from him a complete narrative. He understands the meaning of the questions and answers them with exactness; his conversation is coherent, but it may be said with truth that he does not shine by reason of his intellectual quickness, nor by the extent of the circle of his ideas, which is, on the contrary, very narrow. His mental deficiency manifests itself particularly with regard to the so-called higher faculties. He does not possess the power of synthesis; reasoning, generalizing and especially judging as to the moral aspects of his actions, are all absolutely defective. He is entirely lacking in the power of adaptability to the various circumstances of life and his moral sense is totally wanting. He reasons about the misdemeanors he has committed as if he had never acquired the least idea of

morality. It is evident, in his case, that the dulling of the intellectual development, which is congenital, has affected the moral sense and the so-called higher intellectual faculties more than those of the lower order (Magnan). Were it not for this absence of the moral sense and the want of adaptability, he could perhaps have applied his limited intellectual power in a normal way to practical purposes, and led a useful life, howsoever lacking in brilliancy it might have been.

Considered just as we find him, we may assert with truth, in the words and meaning of the statute, that E. L. "labored under natural imbecility, or disease, of the mind, to such an extent as to render him incapable of appreciating the nature and quality of the act and knowing that such act was wrong" and, hence, that he is not accountable both from a legal and medical standpoint. This conclusion was accepted by the court and E. L. was committed to the asylum.

We thought that it would be interesting to know the opinion of the directors of the various institutions where E. L. had been incarcerated, and we entered into a correspondence with them.

The directors of the reform school wrote us as follows:

"We have had among our youthful delinquents a boy named E. L. He was in our school from October 5th, 1888, to October 5th, 1893, and he learned the tinsmith's trade; but it was impossible to teach it to him properly or to reform his character on account of the weakness of his mind. His companions considered him demented and were very much on their guard against him, on account of his strange manner of acting and his violence in his moments of anger. He was twelve years old when condemned; he had not made his first communion and as an evident characteristic mark, he was noted 'simple.' He had attended school three years, but neither knows how to read nor write. The young man was condemned for stealing tobacco."

We are indebted to the courtesy of the prefect of the penitentiary for the following information:

"E. L. served almost three years' imprisonment in the penitentiary. As you remarked he is a simple-minded person who is approaching a state of complete imbecility. It was almost impossible to make him understand and follow the regulations of the institution. Before my arrival he was nearly continually in the punishment cells, dungeon, etc., for infraction of the rules. Having found out to a certainty his mental condition, I treated him accordingly. He was very stubborn, but not

wicked. In my opinion he would be better in the asylum than in the penitentiary."

It would seem that this unfortunate young man must be added to the already long list of unrecognized and condemned lunatics who have undergone their punishment to the full extent. It is owing to the keen intelligence and to the humane feelings of the cautious magistrate before whom he last appeared, that he escaped another condemnation.

Adjourned.

E. P. CHAGNON, Secretary.

Notes and Comment

HOSPITAL LABORATORIES.—In the present movement for the erection and development of pathological laboratories in connection with hospitals for the insane, it may not be out of place to call attention to the fact that laboratories and apparatus are of no value unless an equipment of men can also be provided.

Professor Brooks of the Johns Hopkins University recently said in an address at the dedication of the Biological Laboratory of the Western Reserve University at Cleveland, Ohio, that "opportunities do not make success, for the greatest success in science, as in all other works, has been won by men who made their own opportunities. A good horse helps the traveler on his way, but he who rides because he is not able to walk is not likely to make a long or successful journey. Some tell us that there is a law of evolution, a necessary principle of universal progress, that carries things along; that the great advances in scientific knowledge which have been made in one day will continue to run on by virtue of this principle—that if the heirs of all the ages will but wait until they come to man's estate, their inheritance will drop into their laps. I have no patience with this sort of nonsense. Natural laws are not agents who do things, but generalizations from an experience which seems to teach among other things that progress is neither necessary nor universal. I am sorry to say that my own experience of life tells me that it is, unfortunately, a little easier to stand still or to slip backward than to go up hill. The only necessary law of progress that I can discover is that it is necessary to fight pretty hard for everything worth getting, and that it is no light nor easy task to keep what has been won. There have been dark ages in human history, and periods of great intellectual activity have been followed by periods of stagnation and decay. Natural knowledge is not like the corn that grows while we sleep; for if the price of civil liberty is eternal vigilance, the price of intellectual liberty is vigilance more alert and untiring."

It is not enough to secure appropriations for laboratories and apparatus, or to place these useful adjuncts to study under the charge of some member of the staff. An effort should be made to find the man who is able to use such facilities rightly—one who has a genius for work and a conception of the magnitude of the problems involved in the study of the pathology of insanity. As Professor Brooks has so well pointed out, without special, unceasing and untiring effort on the part of those who direct this work, there will be retrogression rather than progress. The history of pathological laboratories in State hospitals thus far has not been wholly encouraging. The tendency of men to do routine work rather than hard study, the habits of indolence growing upon individuals whose work is not scrupulously supervised, the absence of a stimulus which attaches to laboratories where regular teaching is done, and above all the lack of active competition from other workers in the same field have all tended to lower the character of the product of these laboratories. The remedy is the appointment of more experienced men and a closer supervision of their work.

THE AMERICAN NATIONAL COMMITTEE OF THE THIRTEENTH INTERNATIONAL MEDICAL CONGRESS.—We have received the circular recently issued by the American committee of the Medical Congress to be held in Paris in connection with the French Exposition of 1900.

We are not able to say who organized or authorized this committee, but we feel sure that our French *confrères* are not responsible for absolutely ignoring American psychiatrists.

We have no fault to find with the American committee as at present organized. All of its members are representative men in their special departments of medicine; many of them, especially its honored chairman, have notably contributed to the reputation and honor of American medicine. We think, however, we are justified in protesting most vehemently against the slight put upon the oldest national medical organization in the country in failing to recognize it in the organization of this committee. The committee is composed of a president and secretary and twenty members; the surgeons-general of the Army, Navy and Marine Hospital Service, the presidents of the American Medical Asso-

ciation of the Congress of American Physicians and Surgeons, and of fourteen special medical societies and associations, and the American Dental Association! Surely in all this association of representative doctors, surgeons, dermatologists, genito-urinary surgeons, and dentists, it would not have been seriously out of place to have secured the support and co-operation of the American Medico-Psychological Association, especially as there is to be at the congress a section on psychiatry. Those of our readers who recall the unfortunate contentions which arose over the Ninth International Medical Congress held in Washington in 1887, will remember that representative members of the special societies whose presidents have now been asked to form the American committee for the thirteenth congress, did little to aid in making the Washington meeting a success. Our readers will also remember that the members of the American Medico-Psychological Association, then known as the Association of Medical Superintendents of American Institutions for the Insane, gave a hearty support to the congress without thought of personal preference or position, and that the section of psychological medicine was one of the most successful of the several divisions of the congress.

Our first thought was to advise the members of the Association to ignore the congress and its committee, but first thoughts are not always best. We are sure, as we have said, that our *confrères* in France are not responsible for this slight, and the Association is old enough and has by reason of its JOURNAL and Transactions a sufficiently well established reputation and sufficiently numerous affiliations with the medico-psychologists of Europe to assume a dignified position, and, notwithstanding the action of our American associates, heartily support the congress and especially the section of psychiatry of which Dr. A. Ritti, Physician to the National Hospital, Charenton, and Editor-in-chief of the *Annales Médico Psychologiques* is the secretary.

Communications concerning the section of Psychiatry may be addressed directly to Dr. Ritti, Maison Nationale de Charenton-Saint-Maurice (Seine) France, to whom the title and *résumé* of papers intended for the section should be forwarded before May 1, 1900.

Those who desire to become members of the congress should

send in their applications to the secretary of the American Committee, Dr. Henry Barton Jacobs, No. 3 West Franklin street, Baltimore, Md., upon a blank form which is furnished upon application to Dr. Jacobs.

CRAIG COLONY PRIZE FOR ORIGINAL RESEARCH IN EPILEPSY.—Last year Dr. Frederick Peterson, President of the Board of Managers of the Craig Colony for Epileptics, offered a prize of $100.00 for the best original contribution to the Pathology and Treatment of Epilepsy.

The seven papers received were submitted to three members of the New York Neurological Society who gave to the Board of Managers of the Craig Colony the following report:

NEW YORK, October 10th, 1899.

To the Board of Managers, Craig Colony, Sonyea, N. Y.,

SIRS:—The Committee on the Craig Colony Prize for Original Work in Epilepsy, has decided that no award should be made this year. Some of the essays submitted failed to comply with the conditions of the competition, others were more limited in scope than a successful essay should be. Three deserve special mention. Their titles and devices are: "The Pathology of Epilepsy," by $CO\begin{cases} NH \\ 2 \\ O\,H,\,NH \\ 3 \end{cases}$; "Status Epilepticus," by "Aura"; and "The Pathology of Epilepsy," by "On and ever onward."

Respectfully,

PEARCE BAILEY,
Sec'y N. Y. Neurolog. Society.

GEO. W. JACOBY,
Ex-Pres., N. Y. Neurolog. Society.

IRA VAN GIESON,
Director Pathological Inst. of the N. Y. State Hospitals.

The prize of 1899 not having been awarded in accordance with the report of the Committee, Dr. Peterson now offers a prize of $200.00, for the year 1900, under similar conditions. This

sum will be awarded to the author of the best contribution to the Pathology and Treatment of Epilepsy. Originality is the main condition.

The prize is open to universal competition, but all manuscripts must be submitted in English. Each essay must be accompanied by a sealed envelope containing the name and address of the author and bearing upon the outside a motto or device which is to be inscribed upon the essay.

All papers will be submitted to a similar committee, consisting of three members of the New York Neurological Society, and the award will be made upon its recommendation at the annual meeting of the Board of Managers of the Craig Colony October 9th, 1900.

Manuscripts should be sent to Dr. Frederick Peterson, No. 4 West Fiftieth St., New York City, on or before September 1st, 1900. The successful essay becomes the property of the Craig Colony and will be published in its medical report.

INTRODUCTION TO PSYCHIATRY.—Mendel's contribution to the *Ebstein-Schwalbe'schen Handbuch der Prakt. Med., Bd. V*, upon the preliminary outline of psychology and the classification of insanity, has been reproduced, under the above title, in the *Deutsche Medicinische Wochenschrift, 30 November, 1899, No. 48.* The author recognizes the difficulty of a pure classification in the unsettled state of etiological and pathological knowledge, and presents the mixed *schema*, which follows. He uses the term " psychosis " in a general sense, as so many conditions have been assigned to the curable forms, unadvisedly, as to render undesirable the limited use of this term to the curable forms alone. Functional psychoses present, first, a form characterized by hallucinations at its inception and persisting during the ensuing obliteration of consciousness—" hallucinatory delirium." Melancholia may be included in the category of functional psychoses; as also a line of conditions whose basis is disorder of the association system of the mind. These disturbances may be classified as:

a. Morbid increase of association-ideas: mania.

b. Abnormal arrangement of ideas, or incoördination: paranoia.

c. Diminished activity of the association system: acute dementia.

The complete classification is tabulated as follows:

I. Idiocy.

1. Imbecility.
2. Idiocy.
   (Mutism.)

II. Functional Psychoses.

1. *Hallucinatory delirium:*
   a. Active.
   b. Passive.
2. *Mania.*
   Typical mania; hypomania; recurrent mania; mania gravis (acute delirium); periodic mania.
3. *Melancholia:*
   a. Melancholia simplex; hypomelancholia.
   b. Typical melancholia:
      1. Melancholia hypochondriaca.
      2. Melancholia moralis.
      3. Melancholia generalis. Katatonia.
4. *Circular psychoses.*
5. *Paranoia:*
   a. *Paranoia rudimentaria; imperative concepts.*
   b. *Typical paranoia:*
      1. Paranoia simplex:
         a. Acute.
         b. Chronic.
      2. Paranoia hallucinatoria:
         a. Acute.
         b. Chronic.
6. *Dementia acuta.*
   (Approximation of the terminal stages of the functional psychoses in secondary paranoia and secondary dementia.)

III. Psychoses Dependent upon Central Neuroses.

1. *Epileptic psychoses:*
   a. Preëpileptic psychoses.
   b. Postepileptic psychoses.
   c. Epileptic equivalents.
   d. Chronic epileptic psychoses.
2. *Hysterical and hystero-epileptic pyschoses.*
3. *Choreic pyschoses:*
   a. With Sydenham's chorea.
   b. With chronic progressive chorea.

IV. Intoxication Psychoses.

1 *Auto-intoxication psychoses:*

a. Myxoedema of adults.
b. Myxoedema of infants (sporadic cretinism); infantilism.
c. Cretinism.
d. Psychoses with exophthalmic goiter.
e. Psychoses from auto-intoxication from intestines or other organs; from carcinoma, tuberculosis, Bright's disease, gout, diabetes.

2. *Psychoses depending upon a poison introduced into the body from without (exogenous psychoses):*

a. *Psychoses induced by infectious diseases; ergotinism; pellagra.*
b. *Psychoses induced by organic poisons:*
1. Alcoholic psychoses:
a. Acute psychoses; apoplectic and convulsive drunkenness.
b. Subacute psychoses:
1. Delirium tremens:
a. Abortive.
b. Chronic.
c. Febrile.
d. Polyneuritic.
2. Alcoholic melancholia.
3. Alcoholic paranoia.
c. Chronic alcoholic psychosis; alcoholic paralysis.
d. Periodic drunkenness; dipsomania.
2. Morphinism.
3. Cocainism.
4. Chloralism; chloroformism; aetheromania; bromidism; absinthism; opium habit; cannabisism; nicotinism.
c. *Psychoses induced by inorganic poisons:*
1. Carbon dioxide psychoses (acute, chronic).
2. Hydrogen sulphide psychoses.
3. Iodoform psychoses.
4. Saturnism.
5. Hydrargyria.

V. Organic Psychoses.

1. *From diffuse disease of the cerebral cortex:*

A. Progressive paralysis of the insane.
1. Demented form:
a. Beginning with mental changes.
b. Beginning with paralytic symptoms.
2. Classical form.
3. Agitated form.
4. Depressive form.
5. Circular form.
6. Ascending paralysis.
B. Senile dementia; senile cerebral atrophy.
C. Arteriosclerotic psychoses; male climacteric; premature senility; dementia apoplectica; psychoses with paralysis agitans.
D. Acute haemorrhagic encephalitis.,
E. Syphilitic psychoses:
1. From disease of the cerebral arteries.
2. From gummatous tumors;
3. From gummatous meningoencephalitis.
4. From hereditary syphilis.

2. *From focal disease of the brain* (pachymeningitis):
   A. Psychoses after apoplectic attacks.
   B. Psychoses due to cerebral tumors; cysticercus and echinococcus.
   C. Psychoses due to abscess of the brain.
   D. Psychoses due to multiple sclerosis (traumatic psychoses; sunstroke; heatstroke).

PUPILLARY DISORDERS IN THE INSANE.—At the last meeting of the Association of Assistant Physicians in Cleveland, Dr. Neff, of Pontiac, Mich., presented an excellent paper upon pupillary disorders among the insane, which contains a good resumé of our present knowledge of the subject. He says:

"The estimation of the condition of the pupil may seem to be an easy matter, but unless care is exercised many mistakes may easily occur. Hoche ("Early Diagnosis of Progressive Paresis," Alienist and Neurologist, January, 1898) has sounded a note of warning regarding pupillary examinations. His remarks are so pertinent that I quote verbatim from his article:

In almost no other symptom is a correct technique of examination so essential as in testing the condition of the pupils; in almost no other are the simplest rules so often violated. . . . In judging of the size of the pupils a diffuse light of medium intensity is indispensable, but above all is a symmetrical position of the light with respect to both eyes. This is equally necessary in determining the difference in the size of the pupils, as in a side illumination from a window, *e. g.*, in which one eye is in the shadow of the nose. In this case a difference in the pupils is found in perfectly healthy persons. . . . The examination as to quantity and quality of the light reaction demands not only a correct, but, if subjective certainty is to be attained, also a uniform method; it does not suffice, as is so often seen, to briefly shade the eye to be examined, which is perhaps inspected in a dark corner of the room, with the hand held before it. Also the method of opening and closing the lid with the fingers is improper, because slight movements of the pupils may readily escape the examiner in consequence of the unavoidable movements of the bulb and the light reflex on the cornea occurring suddenly at the moment of opening the lid, while on the other hand the involuntary movement of accommodation of the pupils occurring almost always simultaneously, may deceive as to the light reaction. The requirements which must be complied with for a reliable examination of the pupils, are, that the examiner can constantly and clearly see the pupils during the shading and illumination of the eye, and that at the moment of illumination movements of accommodation, as well as of convergence, do not occur in the eye to be examined. The latter are not easily excluded in the insane. The shading

hand, whose removal suddenly subjects the retina to the light of the window, must not be held in the visual axis, otherwise the eye will accommodate to it, but the eye must be half covered from the side of the light; the patient looks past the examiner at a distant point, then at the moment of illumination or shortly after the contraction of the pupil is observed, or possibly the absence of this manifestation, reflex immobility. In insufficient daylight it is best to arrange for a light behind the examiner's head, possibly a brilliantly burning match, so that the eye previously in the shadow is suddenly illuminated. In spite of the questionable result, do not neglect testing the light reaction in the dark-room by a lateral lens illumination. Experience teaches that the more carefully the pupils are examined the fewer become the cases in which—except in tabes and progressive paresis—true reflex pupillary immobility is found.

The above precautions were taken in the examinations made by the writer. I would particularly emphasize the importance, as a final test, of estimating the pupillary reflex by artificial light. This can be so graduated by simply moving the light to and from the patient that a minimum amount of light can be thrown through the lateral lens. This method is especially valuable for insane patients. A diagnosis of immobile or Argyll-Robertson pupil should never be made without using this method.

The following tables and deductions have resulted from an examination of the pupils of 300 male patients. The paper should be considered in the nature of a preliminary report. It is hoped that the results can soon be supplemented by more extended and better elaborated tables. The 300 cases were purposely not selected, in order, if possible, to make the conditions more diverse.

All pupils were examined, 1, as to the relation of size, viz., the presence of irregularity; 2, in reference to reaction to light stimulus; 3, in reference to the reflex accommodation. An effort was made to determine the iris reflex to convergence, but owing to the difficulties encountered, it was abandoned.

1. *Irregularities.* Irregularity was detected in 27 (9%) cases; in 14 the right pupil was the larger, the left pupil being more dilated in 13 cases. The phenomenon was distributed among the psychoses as follows: It was found in 14 cases of terminal dementia; local eye disease could account for its presence in 6 cases; it occurred in 9 cases of paretic dementia; it was associated with immobility in 7 cases, and with the Argyll-Robertson pupil

in 2 cases; it was also found in one case of periodical insanity, and in 3 cases classed as organic dementia. In the former, apparently, the condition had no bearing on the form of insanity; in the latter instance the phenomenon in two cases, was due to local eye disease, and associated in one case with pupillary immobility. Bilateral myosis was present in 7 cases (3.6%). It was found in two cases of terminal dementia, probably due to senile changes. It was found in four cases of paretic dementia, combined with the Argyll-Robertson in two, and with complete immobility in two cases. Extreme bilateral dilatation, or mydriasis, was found in two cases. In both instances it was associated with an optic atrophy in organic brain disease.

The natural inference is that irregularity *per se* is of little importance, and verifies the observation that pupillary symptoms in insanity are only important when they have developed during the disease, and other local causes can be excluded.

The presence of irregularity in 9 cases of paretic dementia (4.7% of all paretics examined), combined with immobility and reflex iridoplegia, is a matter of interest.

2. *Iris reflex to light.* 208 cases (67% of all cases examined) showed an active or normal response to light. It was distributed among the insanities as follows: It was observed in four cases of acute melancholia, three cases of chronic melancholia, six cases of periodical insanity, eleven cases of epileptic insanity, ten cases of chronic alcoholic insanity, twenty cases of primary delusional insanity, two cases of secondary delusional insanity, one hundred and thirty-seven cases of terminal dementia, two cases of chronic dementia, and twelve cases of imbecility.

In 77 cases (25.6%) the pupillary reaction was sluggish. With the exception of six cases this was bilateral. It was distributed among the insanities as follows: In chronic melancholia three cases, periodic insanity nine cases, epileptic insanity four cases, chronic alcoholic insanity five cases, primary delusional insanity five cases, secondary delusional insanity one case, terminal dementia forty-three cases, chronic dementia five cases, imbecility two cases. The Argyll-Robertson pupil was found in 8 cases (2.6%). All of these cases were victims of general paralysis, and furnished 33% of all paretics examined. Immobility of pupils was found in 13 cases (4.3% of all those examined). Ten cases were paretics, and three were cases of cerebro-spinal syphilis.

It is seen that both the active and sluggish pupil are quite well distributed among the various forms of insanity. With the exception of five cases of chronic alcoholic insanity, and five cases of chronic dementia, it could not be definitely said that the sluggish pupil had any direct bearing on the form of mental disease.

The occurrence of reflex iridoplegia and complete immobility, in cases of paretic dementia alone, is a verification of the results of other observers.

3. *Iris reflex to accommodation.* Errors of accommodation were manifested principally by sluggishness. A sluggish reflex to light, especially in cases where presbyopia existed, was accompanied by a similar accommodative error.

Excluding the cases of immobility of pupil, a total bilateral absence of reflex to accommodation (cycloplegia), was not observed. In other words, the ability for accommodation in many cases was closely related to refractive errors observed in degrees of presbyopia.

It seems proper to note, as having an indirect relation to the pupillary conditions found, that the following local eye diseases were detected: conjunctivitis in 15 cases; arcus senilis in 45 cases; keratitis in 3 cases; iritis in 5 cases; cataract in 4 cases, and pterygium in 15 cases."

ANNUAL MEETING OF ASSOCIATION.—The American Medico-Psychological Association will meet in Richmond, May 1, 2, 3 and 4, 1900.

Numerous expressions of appreciation of the selection of this charming Southern city as a meeting place have been received from members and a large attendance is confidently predicted. The Executive Committee is busily at work on arrangements for the meeting. When these are perfected an announcement of plan and program will be made.

One purpose in view in making this announcement is to obtain from members who expect to read papers an early intimation of such intention. Furnishing titles of papers now will give the Council valuable knowledge of the probable length of the program, and the necessity for soliciting papers may be avoided altogether. At the coming meeting abundance of time will be allowed for reading and discussion. Criticism has been

made that the programs at New York and St. Louis were too crowded and that members found little relaxation from work. This year more time will be available for rest and social enjoyment. Please inform the Secretary soon of the title of your paper; or if you cannot now decide upon a subject, signify the intention to present a paper, the title of which may be sent later.

C. B. BURR, Secretary.

THE TWELFTH CENSUS AND INSANITY.—The Act of Congress relating to the Twelfth Census provides that the Director shall collect the statistics of special classes, including the insane, feeble-minded, deaf, dumb and blind. By an unfortunate restricting clause such enumeration shall be confined to persons contained in institutions. There will be universal regret that, in the absence of amending legislation, we shall thus "foozle" the opportunity to make a complete census of the insane and the other defective classes of our population. While it is true that no accurate count of the insane ever has been, or indeed can be, made, it were surely most desirable to obtain the best possible approximation thereto. That the ordinary census enumerators could not be entrusted with the task—such are its inherent difficulties—goes without saying, yet with the aid of physicians, acting in conjunction with them, much of the apparent hopelessness of the undertaking would disappear. And in any event there would be furnished, what has so long been needed, a basis of comparison that would enable the alienist to answer the question without guess-work, whether insanity is on the increase in the United States. No query is propounded with greater persistency by the average layman who enters into casual conversation with the specialist, and none is answered as a rule with more hedging vagueness. It behooves all who are interested in this vexed and vital question to use their influence with members of Congress and others to secure such amendments to the law as may remove the short-sighted restriction of which we complain. Fortunately for the specialty of mental medicine the Assistant Director of the Census, Dr. F. H. Wines, is a publicist whose interest in the insane is well known, and upon him one may safely depend to do all in his power to meet the situation with intelligent effectiveness.

HOUSES OF DETENTION FOR THE INSANE.—While the United States is always well in the front rank among civilized nations in hospital provision for the insane and may claim, not immodestly, for its *Irrenwesen* some features that are in advance of the Europe from which it learns so much that is good, France, and especially Paris, has long excelled us in the safeguards with which she has surrounded cases of occurring insanity. With us, if one excepts the Insane Pavilion of Bellevue Hospital, which is for public patients only, there is no adequate intermediate hospital for receiving such persons pending commitment to an asylum. Thanks to the intelligent zeal of one of the editors of this JOURNAL, the new Albany Hospital has taken the lead by meeting this demand in a projected detention pavilion with accommodations suited to the requirements of all cases of mental disturbances. The wisdom of this plan is manifest. It is perhaps the forerunner of the psychopathic hospital for which Dr. Peterson pleaded so earnestly in his address before the American Medico-Psychological Association at its last meeting. The supervisors of Albany county have generously appropriated $18,000 towards this addition, annexing to the gift certain stipulations that conserve the county's rights. It is impossible to overestimate the great benefit that must accrue to a community in which such a pavilion exists. It will prove a Godsend to families that are suddenly confronted and overwhelmed with the problem of making immediate provision for delirious persons, sane or insane, and under a liberal insanity law, it is not too much to hope that many cases of transient mental disturbance may be healed in such intermediate quarters without suffering the stigma of legal commitment to a State or other hospital for the insane. The JOURNAL congratulates the Albany Hospital warmly.

GIFT TO BUTLER HOSPITAL.—If the century that is just closing has witnessed vast accumulations of wealth by individuals, it may also be said that one of its distinguishing marks has been a growing tendency to distribute that wealth for the benefit of the mass. Men and women no longer wait until they are where "Honor's voice" cannot "provoke the silent dust" before earning the gratitude of their fellows, but give out of their abund-

ance while they yet live and can themselves reap the earthly reward of good deeds in the erection of monuments that bear material witness to a wise benevolence. The history of the Butler Hospital at Providence is replete with instances of such enlightened giving. Two years ago the Goddard House, built and equipped by the family whose name it bears, as a memorial to a brother (a trustee), "upon whose deeds of love and charity there shone no other light save that of Heaven," was opened as a high-class provision for women patients. Now comes forward Mrs. W. G. Weld, of Boston, with a gift of $75,000 for a new building to perpetuate the memory of her late husband, also one of the trustees of the hospital. Plans have been drawn for the Weld House and the work of construction will begin early next spring. With this addition to its group of noble buildings the Butler Hospital will be fortunate indeed in the possession of what it has long needed, namely, better provision for patients of the excited class.

Increase of Insanity in Massachusetts.—From statistics covering five years the latest figures made up by the State Board of Insanity, in Boston, it appears that the increase of insanity on first admissions is 36 per cent.; in the number remaining 29½ per cent., while the whole population has gained but 12 per cent., assuming the population of Massachusetts to be now 2,800,000. The insane deaths have increased 33⅓ per cent., the recoveries 16 per cent.

Alcoholism and Morphinism among Physicians.—Dr. Chapin of the Pennsylvania Hospital for the Insane can usually be depended upon to meet and overcome in his quiet and effective way the extremist who reflects upon his own profession by promulgating views that incriminate and yet are at variance with the facts of experience. Not long ago Dr. T. D. Crothers of Hartford made,[1] and in the making was the means also of spreading, the sensational statement that from 10 to 20 per cent. of physicians are intemperate in the use of alcohol and drugs. This was a sweet morsel for the newspapers. But it is not difficult

[1] Medical Record, Nov. 25, 1899.

to show by the statistics of such a hospital as that over which Dr. Chapin presides how much Dr. Crothers has erred in his conclusion. Since 1884, a period of fifteen years, there have been admitted 31 physicians[3] who were addicted to the use of alcohol or some drug. They all entered the hospital without certification as voluntary patients, and were probably in the main of the same class as those who enter institutions for the treatment of liquor and drug habits. Dr. Chapin's figures do not tend to corroborate Dr. Crothers' assertion—one on its face, even in the absence of statistics, so extravagant as to carry its own refutation.

[3] Sajous' Monthly Cyclopædia, Dec. 1899, and Philadelphia Medical Journal, Nov. 25, 1899.

Medico-Legal Notes

THE NEW COMMITMENT LAW OF WISCONSIN AND ITS OPERATION.

By W. F. BECKER, M. D.

This law—the product of a joint committee of doctors and lawyers—has now been in force over two and a half years. It was enacted in consequence of the old law having been declared unconstitutional by the Circuit Court of Milwaukee County, on the ground that it failed to furnish protection from too easy commitment.

In reviewing the present law I wish to say at once that it is not an ideal one, neither as it was introduced, nor as it was delivered from the legislative body. It is a compromise between the medical and legal requirements of the subject and contains many concessions. The ideal law of the doctor is one in which the insane could be treated like other sick, and all judicial proceeding eliminated. Such is the happier process of other countries. But in our own, partly because of our constitution or its interpretation, and largely because our goddess of liberty is a very jealous goddess, the commitment of the insane is hedged in by the most extravagant legal safeguards and what should be a purely medical matter becomes a medico-legal one. Insanity being a disease whose treatment incidentally involves the deprivation of liberty, we have on the one hand the doctors who would subordinate the deprivation of liberty to the treatment, and on the other hand the lawyers, keen only to the question of liberty involved, and so comes the conflict and the necessity of compromise.

This necessity has been particularly great in our own case because the clamor for more "protection" to the alleged insane was "in the air," and manifested itself by attempted legislation hostile to all medical requirements, such as our sister State Illinois suffered for twelve years in having compulsory jury-trial in all cases

of alleged insanity. It was chiefly to anticipate such offensive legislation that the passage of this law was undertaken in co-operation with the bar. The bill finally grew into other lines governing the management of the insane, but I will confine myself only to the subject of commitment as being of chief interest.

The first departure from the old law is in requiring *three* persons instead of one to make application to the judge for an inquiry into the mental condition of the supposed insane person.

This change was made in response to popular clamor for more "protection" from too easy or unjust commitment. If the old law worked any evil whatever, it was open to injustice at this point. I have known of a case where a wife had no knowledge of the examination and commitment of her insane husband, the law having allowed the application to be made by "any respectable citizen."

Such application is to be made to the county judge and not as in the old law to any judge of a court of record, thus giving the county judge exclusive jurisdiction.[1]

This, while already following the system of other counties, happily ended the difficulty we have had in Milwaukee from divided jurisdiction; a difficulty that can best be described by the saying, "What is everybody's business is nobody's."[2] The work is of the character that properly belongs to the county judge, and to limit it to him has the great advantage of securing to one man the wide experience necessary in this difficult and important field of managing the alleged insane. It also facilitates the keeping of records which the law prescribes shall be kept in the county court.

The qualifications of the examining physicians have been extended so that in addition to the requirements of the old law, viz.: Graduation from an incorporated medical college, good character and repute for medical skill, there is required three years' practice or one year's experience in an insane hospital after gradua-

[1] At the legislative session just passed, an unnecessary and retrograde act to extend jurisdiction to the police court was passed. It was the work of a few physicians who had had difficulty in persuading a shrinking judge to do his duty in the matter of jurisdiction. The judge has now been replaced and happily the law is quite dead, though not repealed.

[2] No less than six judges had jurisdiction under the old law and *ipso facto* all the court commissioners.

tion and *registration* as thus qualified on a list to be kept for that purpose by the judge.

The advantages of such registration are that it gives the judge the opportunity to select qualified men; it allows those physicians who care to do the work to register their willingness, and the not inconsiderable number who for various reasons (chiefly inexperience and fears of litigation) do not care to engage in it, to withhold their names from the list. Under a strenuous interpretation of the old law, a physician was made to serve *nolens volens*. As the law required that "such physician *shall* proceed without unnecessary delay" it is quite assumable that besides placing himself in contempt of court, a physician might be held for damages which could be laid to the result of his refusal or procrastination in executing his appointment. Such contingencies are avoided by registration. It can work no hardship, as there is nothing in the law to prevent a physician who may not be registered and yet may be the proper person to act in a given case, from registering at the time of his appointment.

The next sections of the new law (2 and 3) are chiefly concerned in attempts to cover the alleged unconstitutionality of the old one. The impugnment of the old law was on the ground that it failed to give the alleged insane person a *notice* to the effect that application had been made for an examination into his mental condition and of his right to a hearing, or trial, in defense of the proceeding. It was thus said to be in contravention of the constitution, which provides that no one shall be deprived of his liberty without due process of law—"due process of law" being interpreted to mean *notice, hearing* and *judgment*. These sections provide that the physicians give such notice to the patient unless it would be "injurious" or of "no advantage" to him. They state in their report to the judge whether they have or have not given the patient such notice, and if they have, whether the patient desires a hearing or not. The judge then takes ultimate discretion as to sending or withholding such notice. In cases where he sends it, a copy of the notice is also left with some member of the patient's family or some friend.

It will be seen at once that if notice and hearing be a constitutional right, it cannot be waived in *any* case, and it is in this respect that the law may be criticised as failing to completely

overcome the constitutional objections of the old one. But in answer it may be said that it would be a most flagrant violation of the medical requirements of the unfortunate insane to give notice of trial in every case, that all concessions which medicine can grant without loss of self-respect are here made, that they more than cover the matter practically and that what remains unsatisfied is mere theory. Indeed, so long as the commitment of the insane continues to be regarded as a quasi-criminal proceeding rather than *paternal* in its nature, it may be doubted whether any law were constitutional unless it provided a guardian *ad litem* in every case—a practically unnecessary and costly process; or, unless it placed the alleged insane on the same footing as a criminal accused of crime, a most reprehensible thing.

As to the question of jury-trial which may best be alluded to at this point, that is also in our new law left discretionary with the judge and in respect of the constitutionality of so leaving it, the same things may be said as were said of the question of notice, except that it has twice been decided in Wisconsin that the right of jury-trial does not extend to inquisitions of insanity.[1] Before commitment the patient or any friend may apply for a jury-trial of the question of his sanity; after commitment this right of application is extended only to the friend acting in the patient's behalf.

As to the operation of the *notice* and *hearing* sections there has been a wide difference between the State at large and Milwaukee County containing its metropolis. The percentage of persons to whom *notice* of right to a hearing was given is, for the State 73 per cent., for the city only 30 per cent. So too in the matter of hearings. Out of more than 2000 persons committed from the State at large, 169 are reported to have had a *hearing* (*circa* 8 per cent. of the whole and 11 per cent. of those who were given a notice of that right), while in Milwaukee County there were practically no hearings, one or two only of those given notice of a right of hearing desired such hearing and one of these did not appear at the time set for the same.

These discrepancies between the State and the city are no doubt owing to the fact that in many of the outlying counties the judge is usually present at the physicians' examination (either in or out

[1] Crocker *vs.* State, 60 Wis., 503. Also Gaston *vs.* Babcock, 6 Wis., 553.

of court) which is interpreted in the commitment as a *hearing* before the court. While this too to some degree explains the excess of *notices* in the State over those in the city (this so-called *hearing* implying *ipso facto* a *notice* which is so recorded in the papers) a large part of such excess is still unaccounted for. Some physicians have probably identified "hearing" with their own examination of the patient and given notice of such to the patient, others may have supposed the giving of notice compulsory.

Only three or four jury-trials have been given in all. It is difficult to know how many, if any requests for jury-trials were refused, for, as already stated the new law leaves the right of extending jury-trials to the alleged insane *discretionary* with the judge. In so leaving it, the new law may be said to be less strenuous than the old one which made jury-trial obligatory whenever desired. Yet there must be some safeguard against a plainly insane man having repeated jury-trials for the mere asking. A case of this kind occurred in the State recently where an unquestionably insane man demanded three successive jury-trials, and there was no other course under the old law than to grant them. One of the most abiding convictions from experience in the commitment of the insane is, that the laws should give the widest possible discretion to the judge. As cases differ so much, they do not fit the same treatment.

Such discretion our law allows in the next step in commitment. Thus after appointing the physicians the judge may do any of the following things: He may accept the report of the physicians and straightway make out his order of commitment. He may order the patient to be brought before him and the examination by the physicians to be conducted in his presence. He may appoint a guardian *ad litem* in the proper cases. He may order the temporary detention of the patient in suitable quarters, pending further medical observation or judicial proceeding. He may make any further investigation of the case as may seem to him to be necessary and proper, or grant a jury-trial.

The temporary detention feature is one of the best innovations in our law, and much profit should come of it. The only ground for temporary detention under the old law was such a condition of the patient that the safety of the public demanded his immediate arrest. The provision now is not only that temporary de-

tention may be granted in *any* case, but that such detention shall not be in any jail or lockup or poorhouse wherever it can be avoided. Counties are authorized to provide suitable quarters.

It is to be hoped that physicians will see that the widest possible application is made of this section both to prevent the injustice of further confinement of the insane in jails or lockups and to promote the establishment of detention hospitals *per se* wherever they are needed, which will save the necessity of commitment in 25 to 30 per cent. of cases of supposed insanity.

Section 6, which provides for the method of conveying patients to the hospitals or asylums, was the fighting ground of opposition to the bill. As originally drawn, this section provided that in place of the sheriff to convey patients to the hospital, the superintendent shall be notified to send an attendant from the institution to convey the patient thither. This was manifestly a more progressive, humane and economical proceeding than that which turned sick men into the hands of sheriffs who had no familiarity with their management and often used measures unnecessarily harsh; but as it deprived the sheriffs of this work, with its fees, a strong lobby of opposition was brought to bear upon it and so successfully that it jeopardized the passage of the bill, and the offensive clause was withdrawn.

Under both the old and the new law any friend may convey the patient to the hospital, for which the law allows him his actual expenses. Physicians should encourage this wherever possible. It is altogether too common to call upon the sheriffs. It is not only unnecessary in the large majority of cases, but it is unjust to convey a sick man to an insane hospital in the custody of an officer of the law as if he were a criminal, instead of having him taken by his friends as he would be taken to any other hospital. It seems to have fallen into a custom as unnecessary as it is unjust, and cannot but add to the bitterness and suspicion and persecutory ideas which fill the patient in that sad hour of his life.

In this connection the common practice of inveigling patients to the hospital on the pretext of taking a "drive" or any other false pretences must be strongly condemned. It is as common as it is mischievous and unnecessary. Indeed from beginning to end the more the insane are accorded the rational, dignified and respectful treatment that we extend to other sick persons,

the easier will be their management and the better for them and their friends.

Although it has been the custom to do so, this law for the first time authorizes superintendents to parole a patient when it is safe and proper. It further provides that if within two years he is not recalled from parole the authority to recall him shall end and the presumption of insanity against him shall cease, and unless a new adjudication of insanity shall be made against him he shall be presumed sane as if his sanity had been judicially established.

This is, I believe, an innovation in commitment laws. It brings about the rehabilitation of the patient by time without the intervention of judicial process. While this could furnish opportunity for fraudulent advantage being taken of a man who was still insane but by virtue of the expiration of his parole had become legally sane, its advantages more than offset this possibility.

The last feature which I shall consider and perhaps the most signal innovation of our new law, is that of *voluntary* commitment. Patients may, in the discretion of the superintendent and with the certificates of two physicians, enter an insane hospital voluntarily for treatment. There is no judicial process whatever required in these cases. Patients so admitted, however, must pay a minimum sum, to be designated by the authorities, for their maintenance, and they may leave the hospital when they desire, on giving five days' notice, if they are in a fit condition to go at large.

This clause ought to be widely useful. It ought to reduce much the number of commitments with the obnoxious judicial process and the legal adjudication of insanity which they involve. Many patients may and ought to be persuaded to place themselves voluntarily under treatment rather than be committed. It ought to increase the therapeutic responsibility of hospitals for insane, and ought also to promote hospital treatment in the early and most hopeful stage of mental disorder where treatment is now often long postponed because of popular horror of commitment. It also places hospitals for the insane in their proper light before the public, not as bedlams to be shunned, but as

sanitaria which patients may enter as they would other hospitals to undergo treatment.

I find that superintendents do not like the *voluntary* feature, as it places these patients on a different footing from the others. Out of about 2500 admissions to the insane hospitals of the State since the law has been operative only 17 have been "voluntary," by far the larger percentage coming from the city. But in so far as hospitals for the insane are to be such in fact as well as in name, it behooves superintendents to assimilate them to other hospitals as far as possible, and there is no single way by which they may do this more effectually than by the promotion of voluntary commitment.

To sum up: Since doctors must hold the commitment of the insane essentially a medical matter and only by sufferance a judicial one, and since this law has been a compromise between the medical and legal bearings of the subject, it is not only our right but our duty to construe it in a way most favorable to the interests of the patient. This would be to bring as little judicial or official proceeding into the case as possible, and though it is necessarily somewhat involved in its phraseology, to keep it simple in its operation. Thus it would seem that the proceeding ought to be as follows:

Three respectable citizens make application to the county judge.

The judge thereupon appoints the two physicians.

Such physicians after being registered as qualified, proceed either singly or jointly to examine the patient. For reasons that *notice* would be "injurious" or of "no advantage to him by reason of his mental condition," they do not give him *notice* and state their reasons as here quoted or at greater length in their report. Or if they feel bound to give the notice in certain cases (in which it would seem they are inconsistent if they have no doubt of the insanity or the propriety of commitment) they should explain to the patient that it is a formality and dissuade him from making a defense.

The patient in the meantime to be in temporary detention quarters when and wherever such are established (not in jails or lockups).

The judge in nearly all cases to accept the opinion of the physicians as to notice and their report as to insanity and to is-

sue the commitment without further proceeding, if the patient is found insane.

The patient then, whenever possible, to be conveyed to the hospital by a friend.

In closing it may be asked what has been accomplished by the passage of this law—what has been gained or lost, by the compromise.

To this it may be answered: Removal of the legal and practical chaos that has prevailed in the commitment of the insane in Milwaukee.

Preventing the passage of a "lawyer's law" making notice necessary in every case or establishing compulsory jury-trial or providing guardian *ad litem* in every case.

The leaving of large discretion to the commitment magistrate.

A law which though capable of improvement, is in its practical application not so strenuous as to injure the medical requirements of the insane, yet is strenuous enough to stand muster in the courts and allay all future suspicion of possible fraudulent or improper commitment.

Abstracts and Extracts

THE CHOROID PLEXUS.—Since Albarran's work of 1886, on the choroid plexus, but little has been done for the last quarter of the century upon it. Much attention has been given, nevertheless, to the normal and pathological histology of the membranes and blood-vessels of the brain. For many years neuropathologists have held that the structure of the choroid is essentially different from that of the pial membrane; but the consensus of opinion of latter-day investigation, seems to point to the conclusion that the two structures are probably organically the same.

The studies upon the pathological histology of the choroid in the insanities, has never been particularly productive. It has been found frequently diseased at post-mortem examination, but the significance of the lesions found has not been of great moment in the morbid disease play of psychic life. However, the interest of choroid changes in the insanities is not at a minimum of neuropathological investigation, as the histology of the choroid proclaims the possibility of its earlier and much more frequently diseased alteration than the tardy pial tissue changes.

The studies of Ford Robertson, upon the brain and meninges of the insane, have been materially increased during the past year by the published investigations of Findlay, upon the choroid plexus, which appeared in the last number of Brain. Findlay's paper was based upon the pathological examination of sixty-five cases of insanity, and also upon several normal specimens from the ox, sheep, and calf. This author's conclusions upon the homology of the stratified epithelium of the choroid and the ependymal epithelium, rests upon both tissues presenting the "prickly" appearance, first described by Henle.

The cellular appearance of degenerative epithelium of the choroid, in the senile insanities, as manifest in pigmentations and vacuolations, is of interest when we take into account that both processes are common in other parts of the brain-tissue, and to-day such changes are held to be a fair index of aging; although it should be held in mind that the normal variant limits of pigmentation in nervous tissue must be very great. It is of passing interest to note that investigations so far have not proven the presence of nerve-supply to the choroid except those accompanying the blood-vessels acting as vasomotor nerves.

In regard to the tumor formation of the choroid, while not especially liable to growths common to tissues of its constituent elements, the great frequency with which concentric and mulberry bodies and cysts have been found, has been proverbial. Even in supposedly normal human brain,

sandy accretions are very common but are decidedly more frequent in the insane. It is rare to find brain sand in the choroid of animals. Findlay holds they are not deposits from tissue fluids, as was long ago announced by Virchow, but such psammomata are the result of proliferation and degeneration of endothelial cells in lymph spaces, first consisting of hyaline concentric bodies formed from the single cell. The mulberry bodies have a similar origin.

On three occasions, the author finding laminated ostroid plaques resembling true bone with a complete vascular system, is of unusual interest.

Probably but few will accept the author's suggestion that the hyaline degeneration of the connective tissue of the smaller villi, whenever such atrophy of the villi is more or less extensive, may account for the atrophy of the choroid in senile dementia.

Dr. Findlay's study is well illustrated by photomicrographs, and forms a worthy scientific presentation upon the normal and pathological histology of the choroid plexus.

L. P. C.

Book Reviews

The Nervous System and its Constituent Neurones. D. Appleton and Company, 1899. 8vo., 1121 pages, 676 illustrations, 2 colored plates. By Lewellys F. Barker, M. B., Tor., Associate Professor of Anatomy, The Johns Hopkins University, and Asst. Resident Pathologist, The Johns Hopkins Hospital.

In 1891 Waldeyer published a little book of 60 pages, entitled "Ueber einige neuere Forschungen im Gebiete der Anatomie des Centralnervensystems," which gave a clear and concise account of the history of the development of our knowledge concerning the constituent cell elements of the central nervous system. He presented at some length the ideas of Cajal and others concerning the essential morphological independence of these elements, and showed how much more definite and simple our ideas concerning the nervous system become if these views are accepted. Waldeyer's book at first received but little attention. The prominence, however, given to the doctrine of independent cell elements, through its acceptance by such men as His and Koelliker, and the support given it by numerous workers with the newer methods, soon caused it to be generally accepted. The book came into considerable demand and still remains the simplest and clearest presentation of the "neurone" doctrine.

A vast number of investigators have been engaged during the last ten years in the study of the cell elements of the nervous systems of various animals. Of late the pendulum, which at first swung well towards the side of the independence of the "neurones" has begun to swing the other way. Many objections have been brought against this theory in the simple form in which it was originally propounded. Barker has endeavored in the present volume to present the results of the most important of these more recent investigations and so far as possible to bring into harmony the various ideas that have been set forth.

"In the first part of the volume the newer conceptions of the histology of the central and peripheral nervous organs are reviewed. In the succeeding chapters the attempt has been made to apply the neurone conception—that is, the cell doctrine—as consistently as possible, in the explanation and description of the complex architectonics of the nervous system. The term 'neurone' is used throughout in the widest sense to mean a cell belonging to the nervous system with all its parts, not in the more restricted sense in which many authors employ it and to which objection has in many quarters quite properly been made."—"Especial pains have been taken in the selection of the cuts."—"Of the illustrations

borrowed from original articles, a few have been taken, by kind permission, from American and English publications. The majority are, however, derived from foreign sources—French, German, Italian, Russian, Dutch, Spanish, and Swedish. In every case credit has been given to the author of the original article containing the illustration, and in the majority of instances the title of, and exact reference to the monograph or journal whence the figure has been derived have been appended."—"The bibliography has been extensively explored in order that the most instructive pictures of the various anatomical features extant in original articles might be drawn upon, and it is hoped that the bringing together in one volume of the results of recent investigators and skilled artists of many lands may be of service to neurological students, especially in English-speaking countries."

"The nomenclature employed throughout the book is almost exclusively that of the BNA. Every effort has been made to maintain a uniform nomenclature throughout, and where descriptions or illustrations have been borrowed from other books or original articles, the author, for the sake of uniformity, has taken the liberty of translating the terms originally employed into terms of the new nomenclature."

The book is divided into six sections: The first section deals with the history of the development of the neurone concept. The account here given is clear and lucid. At the end the author defines his own position. The "neurone" he considers to be the individual cell unit of the nervous system, independent as regards its origin and in many of its functions, though not necessarily without any direct morphological connections with its fellows in the adult. The next two sections, dealing respectively with the external and the internal morphology of neurones, give a clear and interesting summary of a vast number of recent papers dealing with these subjects. The fourth section, on the "Histogenetic Relations of the Neurones" contains a valuable summary of the work of His. Aside from the work of His little of value along these lines has been done on the higher vertebrates. We think the author has given rather too much prominence to the recent purely speculative work on metamerism in the human body. He has been led to assuming as true of the higher vertebrates certain developmental processes only known to exist in certain of the lower vertebrates. Braus, one of the most thorough of the recent students of the relation of the embryonic body segments to the adult musculature and peripheral nervous system in the *Selachians* has this to say of the speculations of Bolk which Barker accepts and presents at some length. "This sklerozone theory of Bolk (1894) is without any bearing on the knowledge of the deeper genetic relations, and can be regarded as having the worth merely of a means of illustrating the adult conditions." (Morph. Jahrbuch, XXVII, 1899, p. 616.

The author is particularly happy in his presentation of the subject dealt with in the next section, "The Neurone as the Unit in Physiological and Pathological Processes." The following subjects are here treated: degeneration and regeneration of neurones, irritability of neurones, direction

of conduction, the relation of trophic to nervous functions and the histological alterations in neurones due to the action of poisons and traumatism.

About 300 pages are devoted to this study of the nature of the neurones. Section VI, which deals with the grouping and chaining together of the neurones in man and mammals, occupies the rest of the book. The author has endeavored, so far as possible to describe the structure of the human nervous system according to the arrangement of the neurones underlying the various functional nervous processes. He clearly recognizes, however, how incompletely the subject can at present be treated. The different groups of neurones are taken up under the following headings:

I. Neurones connecting the sense organs of the body with the central nervous system. Those connected with the spinal cord, and with the rhombencephalon are first discussed, and then those connected with the organs of special sense. The description of the various forms of sensory endings is especially good. I know of no place where a comparable summary of the recent literature on this subject may be found.

II. Neurones within the central nervous system connecting the end-stations of the axons of the peripheral centripetal neurones with other portions of the central nervous system, and neurones which in turn connect the end-stations of the latter with still higher portions of the central nervous system. Here we find summed up, for the most part clearly, the vast amount of literature on this subject to which recent investigations have given rise. We believe, however, that much would be added to this section by the introduction of more pictures in which the third dimension is expressed. Over half of the book is devoted to the treatment of various sensory neurones.

III. Neurones connecting the central nervous system with the voluntary muscles of the body. Many facts not generally known are here brought forth from the literature. Thus, for instance, an account of Sano's interesting studies on the relation of the gray matter in the spinal cord to the body muscles is given. We are sorry that no mention is made of May's work on the intrinsic muscular distribution of nerve fibers. (Zeitschr. für Biologie, vol. xx.)

IV. Neurones within the central nervous system which enter into conduction relation with the lower motor neurones and throw the latter under the influence of other centers. This subject is concisely treated and is illustrated by good diagrams and pictures. In all about 170 pages are devoted to the motor neurones.

V. Projection neurones, commissural neurones, association neurones of the telencephalon. A brief, yet adequate, account is given of this important subject, for the proper understanding of which so much remains to be investigated.

No account is given of the sympathetic system.

Taking the book as a whole we find collected in it a vast number of interesting data. The very scope of the undertaking, that of bringing

together the immense recent literature on neurology, has necessarily given rise to certain defects. There is a lack of balance and an inco-ordination of parts which renders it somewhat difficult for those not well versed in the subject. The beginner wants a guide to those simpler facts which he can see and verify for himself. Yet this book deals mainly with investigations and theories which can be repeated and verified, if at all, only by special investigators in well-equipped laboratories. On the other hand, the advanced worker in biology and the well-grounded physician will find the book of the greatest value. It is a work which all who are deeply interested in the structure of the nervous system should be glad to have at hand. Nowhere else can one so readily become acquainted with much of the more recent neurological literature. The usefulness of the book is greatly augmented by good illustrations, by full and careful references to original sources and by a most excellent index. While the nomenclature used throughout the book is certainly the best now in use, it would probably be more useful and attractive to those accustomed to the nomenclature used in the English anatomies were either the old terms added in brackets in the text or a glossary given at the end.

In conclusion we wish to congratulate the author upon the success with which he has carried out a most difficult undertaking.

C. R. B.

The Physician's Visiting List (Lindsay and Blakiston's) *for 1900.* Forty-ninth year of its publication. Philadelphia, P. Blakiston's Son & Co., 1012 Walnut St. Sold by all booksellers and druggists.

This book contains a calendar for 1900 and 1901; an account of the metric system of weights and measures, prepared by Oscar Oldberg; a table for converting apothecaries' weights and measures into grams; a dose-table for 1900, prepared by Dr. Geo. M. Gould; a brief account of asphyxia and apnoea; a comparison of thermometers; and a table for calculating the period of utero-gestation; followed by blank leaves for a visiting-list, memoranda, addresses of patients, etc. The book is compact and well arranged and can be commended to those of our readers who require such a memorandum-book.

Marriages of the Deaf in America: an Inquiry concerning the Results of Marriages of the Deaf in America. By EDWARD ALLEN FAY. Published by the Volta Bureau, Washington, D. C., 1898.[1]

Few books on the inheritance of human faculties are more important than this volume, which gives the results of researches which have been carried on by the Volta Bureau, which was established by Alexander Graham Bell, "for the increase and diffusion of knowledge relating to the deaf."

Professor Bell has shown that marriages of the deaf are more common

[1] The substance of this review was presented to the Scientific Association of the Johns Hopkins University, December 23, 1899.

in America than in Europe, that they have increased at a higher rate of progression during the present century, that the probability of deaf children is much greater among the deaf than in the community at large, and that deafness—not mere hardness of hearing, but what is called "deaf dumbness"—is also increasing among us, and that we are threatened with a deaf variety of the human race. At the same time, it is clear that the probability of deaf children is not equally great among all deaf persons who marry and have children. A person who has lost hearing by accident or disease, at however early an age, may possibly be in no more danger of transmitting the peculiarity than one who has lost an eye or an arm. It is therefore highly important, in the interest of the deaf as well as in the interest of the community, to determine the conditions which are favorable and those which are unfavorable to the hereditary transmission of deafness.

This report contains more than three hundred and fifty pages of statistical information, giving, for 4471 deaf persons who have married, data regarding the origin of their deafness, the hearing or deafness of the partner in marriage, the date of marriage, the number of children, the number of deaf children, a record as to the hearing or deafness of brothers and sisters, and information as to the existence of other deaf relatives. These tables, which contain a record of the marriages of the deaf far larger than all previous records put together, are of great interest to all students of inheritance, but their motive is philanthropic rather than scientific.

The work was undertaken, and has been carried on, we are told, "in the hope that it might be of service to the deaf and to society by settling definitely the question whether or not the deaf are more liable than hearing persons to have deaf children; and, if it should appear that, notwithstanding the numerous instances to the contrary, they are more liable to this result, by ascertaining whether or not the liability is increased by the marriage of the deaf with one another; also whether certain classes of the deaf, however married, are more liable than others to have deaf children; and, if this should prove to be the case, by determining how these classes are respectively composed, so that, as the result of the conclusions reached, in many instances deaf persons might be advised to follow the choice of their own hearts in marriage, with no restrictions whatever except such as should influence all right-minded persons in this important matter; while, in cases where the deafness of the parent was unquestionably more liable than in others to reappear in the offspring, the persons interested might be effectively warned in time of the danger incurred."

The tables of facts regarding the deaf are accompanied by a thorough and exhaustive analysis, which shows that this practical philanthropic purpose has been attained; and that Professor Fay is now able to give to those deaf persons who contemplate marriage advice which has the value of scientific demonstration.

While deaf persons are much more likely to have hearing children than

to have deaf children, they are much more likely than ordinary normal-hearing persons to have deaf children. Less than one-tenth of one per cent. of all the children of normal parents are deaf, but if one or both parents are deaf, nearly nine per cent. of all the children are deaf. In other words, a normal-hearing pair have no reason to fear that a deaf child will be born to them unless they have more than a thousand children; while if one parent or both are deaf, and they have eleven children, they may, on the average, expect to have one deaf child.

The probability of deaf children is not, however, equally great for all deaf persons, since it depends upon the character of the parental deafness. Marriages of the congenitally deaf, that is, of persons who have never, at any time in their lives, shown evidence of hearing, are far more likely to result in deaf offspring than marriages of the adventitiously deaf, that is, of those who have once heard and have subsequently lost their hearing. Of 526 marriages between a congenitally deaf person and a congenitally deaf or a hearing partner, 111, or 21 per cent. resulted in deaf offspring; and 20 per cent. of the children, or one in each five, were deaf; while of 1155 marriages where one partner was adventitiously deaf and the other adventitiously deaf or hearing, only 40, or 3½ per cent., resulted in deaf offspring; and only 2 per cent. of the children, or one in each fifty, were deaf.

If it were possible to draw this line with rigorous accuracy, and to divide all the deaf into these two classes, all deaf persons with a marked probability of deaf children would be found in the first class, while the members of the second class, the adventitiously deaf, would have little reason to fear the transmission of their deafness to posterity; but, as a practical matter, it is not possible to draw this line with scientific exactness. Deafness is not usually discovered until the child has reached the age when children usually begin to talk; and it is difficult to determine whether the hearing has been destroyed during this period or has been deficient from the first. If the child has suffered from some disease which is known to frequently result in deafness, the case is regarded as adventitious, although it may possibly be congenital. If, on the other hand, no such disease has been observed, the case is likely to be regarded as congenital; but it is, perhaps, just as likely that hearing has been lost in consequence of some unnoticed inflammation of some part of the auditory apparatus, occurring at some time before the deafness was discovered. In fact, one who, having heard, afterwards becomes deaf as the effect of disease, may be an example of congenital deafness. When deafness is said to be inherited, it is not actual deafness, but some constitutional weakness or susceptibility to disease that is transmitted, and a child who has heard and has afterwards lost its hearing may, while regarded as a case of adventitious deafness, have the same significance in inheritance as one born deaf.

The term "congenitally deaf" usually means "supposed to be congenitally deaf," and "adventitiously deaf" often means "supposed to be adventitiously deaf." Some more accurate method of classifying the deaf

must be employed before we can clearly express the probability of deaf children in any given marriage of the deaf.

It is well known that deafness often prevails in families; that deaf persons often have deaf relatives; and the arrangement of the deaf-married persons, according to the existence or non-existence of deaf relatives gives results which are most instructive.

In 437 marriages of deaf persons where both partners in marriage had deaf relatives, more than 25 per cent., or one in four, resulted in deaf offspring; and more than 20 per cent., or one child in each five, were deaf. In 471 marriages where neither partner had deaf relatives, only 2⅓ per cent. resulted in deaf children, and only one child in each hundred was born deaf (1¼ per cent.). When we consider how few persons, especially in America, where changes of residence are frequent, are acquainted with the condition of all their relatives, it is not improbable that there were unknown or unreported deaf relatives in some of these marriages, and that marriages of this class are even less likely to result in deaf offspring than the tables indicate.

Indeed, Prof. Fay is led to the conclusion that even when deafness is congenital, it should not be regarded as a bar to marriage if neither of the partners in marriage has deaf relatives, since the tendency to transmit deafness, if it exists at all, is very slight. On the other hand, the marriage of a deaf person to a hearing person with deaf relatives is much more hazardous than the intermarriage of deaf persons without deaf relatives. In fact, careful study of the tables indicates that the marriage of two hearing persons who have deaf relatives is just as likely to result in deaf offspring as the intermarriage of two deaf persons who have deaf relatives. Taking all the marriages of a year's standing or longer of which the results have been reported, where both the parents had deaf relatives, more than 25 per cent. of the marriages resulted in deaf offspring, and the proportion of deaf children born to them is 20.9 per cent.; where one of the parents has deaf relatives while the other has not, the proportion of marriages resulting in deaf offspring is 6.6 per cent.; where neither of them had deaf relatives only 2.3 per cent. of the marriages resulted in deaf offspring; and the proportion of deaf children born therefrom is 1.2 per cent. The actual percentage of marriages resulting in deaf offspring, and the number of deaf children born therefrom, when neither of the parents has deaf relatives, may be even smaller than these figures indicate; for in some cases the statement that neither parent had deaf relatives is not well authenticated, and in all of them there is the possibility that there may have been deaf relatives who were unknown to the person who filled out the record-blanks. Prof. Fay is led to believe, from the study of the records, that the probability of deaf children, where neither parent had deaf relatives, is very slight, perhaps no greater than in ordinary marriages.

The marriages of the deaf most liable to result in deaf offspring are those in which the partners are related by consanguinity. Thirty-one such marriages are reported in the marriage records, and of these 14, or

45.1 per cent., resulted in deaf offspring. One hundred children were born from these thirty-one marriages, and of these 30, or 30 per cent., were deaf. It is therefore exceedingly dangerous for a deaf person to marry a blood relative, no matter what the character or degree of the relationship may be, and no matter whether the relative is deaf or hearing, nor whether the deafness of either or both or neither of the parents is congenital, nor whether either or both or neither of them have other deaf relatives.

The student of inheritance will, no doubt, be disposed to state this conclusion in more general terms, and to assert that the consanguineous marriage of one who has *any* constitutional infirmity or defect is imprudent and inadmissible, and that since no one can be sure that both parties to a contemplated marriage are constitutionally sound in all respects, no consanguineous marriage is permissible.

The writer of this review prepared, by request, some twelve years ago, an essay on the conditions which are necessary for the production of a deaf variety of the human race, which was printed in the Report of the Royal Commission on the Blind, the Deaf and Dumb, etc. London, 1889.

In this essay he gave reasons for holding the only necessary condition to be that successive generations of persons—either deaf or hearing—*with deaf relatives* should marry and have children.

This opinion was so much opposed to the views on inheritance which were current at that day that none of the eminent men of science—seven in number—who prepared essays upon the same subject, gave it any support, or even took it into consideration. Most of them, indeed, held that a deaf variety of the human race may be expected to result from the intermarriage of successive generations of deaf persons.

Professor Fay's thoughtful and exhaustive analysis of the data afforded by the records of some 4500 records of marriages of the deaf shows that the view of the matter which was reached by the writer twelve years ago, on theoretical grounds, turns out to be a fact so soon as it is submitted to a practical test.

W. K. Brooks.